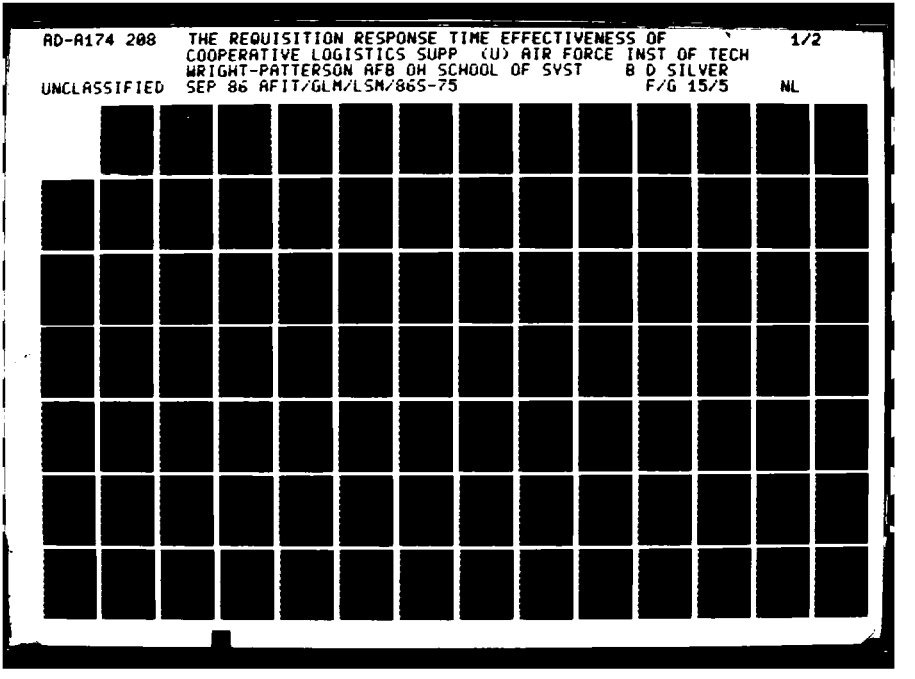
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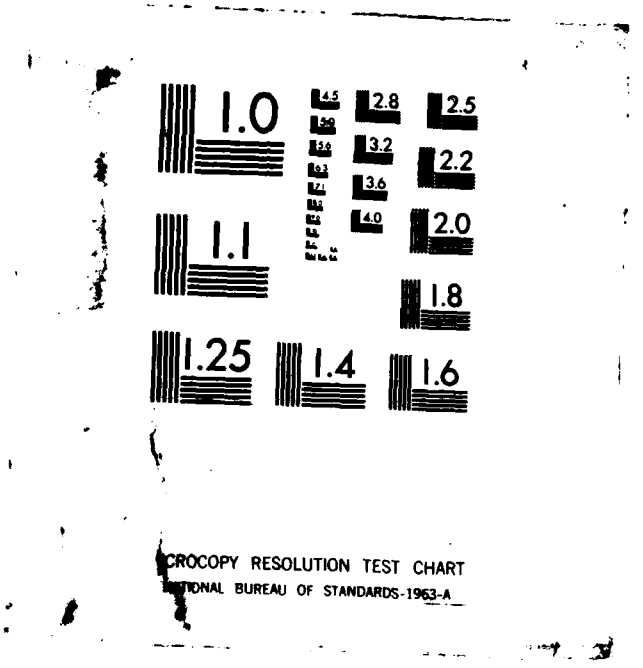
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THE REQUISITION RESPONSE TIME EFFECTIVENESS OF COOPERATIVE LOGISTICS SUPPLY SUPPORT ARRANGEMENTS

THESIS

Bradley D. Silver
Captain, USAF

AFIT/GLM/LSM/86S-75

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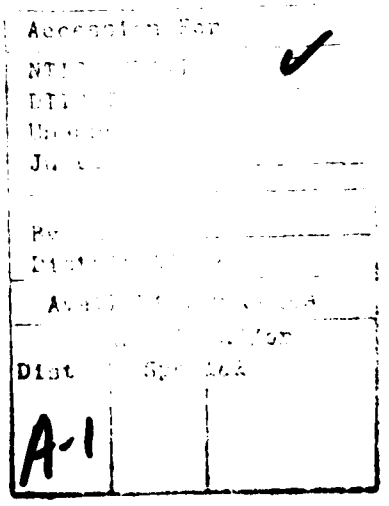

AFIT/GLM/LSM/86S-75

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THESIS

Presented to the Faculty of the School of
Systems and Logistics of the
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Air University
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Requirements for the Degree of
Master of Science in Logistics Management

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Special acknowledgement goes to Dr. Leslie M. Norton who launched this thesis effort before his death. His passing saddened those of us who had the pleasure of working under his skilled and knowledgable guidance. With him died a wealth of knowledge on international logistics.

Bradley D. Silver

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Abstract

This ~~investigation~~ compared the response time performance of programmed and non-programmed requisitions by foreign countries under the Cooperative Logistics Supply Support Arrangement (CLSSA) program. These comparisons focused on three key variables, (1) the type of item being requisitioned (either an investment item or an expense item), (2) the requisition priority with which the request is submitted, and (3) the Air Logistics Center (ALC) supporting the requisition. For the purpose of this research, requisitions submitted in 1984 were the primary focus of the evaluation with those submitted in 1980 serving as a reference point for CLSSA's performance.

Requisitions in each of the comparisons were grouped by their response time in days. The resulting distributions were then analyzed using the chi square test and the cumulative frequency distribution. This analysis highlighted, in terms of the key variables, the areas where CLSSA was working as expected as well as the areas where it was not working as expected. The results of this evaluation suggest that overall there are significant benefits to participating in CLSSA. There are, however, certain categories of requisitions that may not be receiving appropriate treatment.

THE REQUISITION RESPONSE TIME EFFECTIVENESS OF COOPERATIVE LOGISTICS SUPPLY SUPPORT ARRANGEMENTS

I. Introduction

Chapter Overview

This chapter begins by defining the focus of this research effort in terms of the questions it will examine. It then looks at the context of Cooperative Logistics Supply Support Arrangements (CLSSAs) in terms of the magnitude and continuing growth of the United States' Foreign Military Sales (FMS) program and the legislative constraints that affect CLSSA. It also shows where CLSSA fits into the overall FMS program and what differentiates it from the other types of FMS. Finally, this chapter describes the process of initiating a CLSSA, how it is maintained, and how a country's requisitions are filled. This introduction to CLSSA is supplemented by Appendix A which contains a glossary of FMS terms.

Research Focus

FMS customers buying U.S. weapon systems are encouraged to participate in the CLSSA program. Department of Defense policy is that CLSSAs are "one of the most effective means for providing common spares, repair parts and secondary item support for defense equipment of U.S. origin." (8:D) A variety of other DoD and USAF sources echo this contention

that CLSSA is the recommended method for follow-on spares support. The key reasons for these recommendations are reduced requisition lead times and lower prices. (6:7 B 3 c, 13:13-2 c (4), 12: 1-2 e)

This research examines the accuracy of the requisition response time claims relative to CLSSA. In the process of evaluating response time effectiveness, this investigation initially asks the basic question: do programmed requisitions have faster requisition response times than non-programmed requisitions? Using this basic investigative question as a framework for analysis, this research also examines the impact of various factors that potentially influence requisition response time. Specifically, it looks at three key variables: (1) the type of item being requisitioned (either an investment item or an expense item), (2) the requisition priority, and (3) the Air Logistics Center (ALC) supporting the requisition. The specific investigative questions focus on these factors' individual and collective impact upon the difference in response times between programmed and non-programmed requisitions.

Background

The United States' FMS program is a topic of growing and vital interest. Through the FMS program, the U.S. Government sells defense articles, services, and training to eligible foreign governments and international

organizations. FMS includes cash sales by the DoD, as well as sales financed by credit funds or through the merger of Military Assistance Program (MAP) funds into the FMS trust fund. (5:B-12) CLSSA is a critical subset of this FMS process concerned with providing follow-on spares support.

Recent interest in FMS has been prompted by a boom in participation starting in the 1970's. From 1950 until 1974, America's FMS agreements worldwide had only totaled $28.87 billion. By 1984, this worldwide cumulative total had exceeded $144 billion, and the year's total for 1984 alone had reached $14.25 billion. (7:2-3) The Department of State estimated total FMS for 1985 at $15.25 billion and showed proposed FMS for $13 billion in its FY 1986 Congressional Presentation. (10:40) As a subset of these FMS sales, foreign governments and other international customers had United States Air Force (USAF) CLSSA agreements worth $973 million by the end of 1985. During 1985, requisitions against these agreements accounted for over $700 million in sales. (11)

The Legislation and Constraints

The Arms Export Control Act of 1976 (AECA) is the guiding legislative authority for the FMS program. The AECA touches all aspects of the program. Some of the AECA's key provisions make the approval of FMS programs conditional upon a country's use of the weapons and even its international behavior aside from the weapons. The AECA is

the source of such prominent FMS approval criteria as the use of U.S. weapons for self-defense and the country's human rights performance. (15:Sec 3,4) Other provisions govern "credit sales," where the U.S. Government directly extends the credit, and "credit guarantees," in which the U.S. Government guarantees loans by private banking institutions. Moreover, the AECA specifies such details as the length of loans, interest rates, and fees for guarantees. (15:Sec 23,24)

The AECA provisions concerning financing have been especially influential on the CLSSA portion of the FMS process. Two concepts in particular have played major roles--dependable undertaking and no loss to the U.S. Government. A "dependable undertaking" is required before the U.S. can contract for items or services under the FMS program in order to "assure the United States Government against any loss on the contract" (15:Sec 21(a)(1)). This means making funds available to cover any financial obligations as they occur, and paying for sales in U.S. dollars before delivery. (15:Sec 21) To ensure no loss to the U.S. Government, the price charged for FMS items is required to cover all U.S. costs associated with the sale including such expenditures as administrative, research, development, and storage costs. (15:Sec 22)

These AECA concerns are formalized in Annex A of the Letter of Offer and Acceptance (DD Form 1513) (LOA). Some

of the key conditions include: the U.S. Government will not be liable for the items after title transfer at the point of origin (9:A.4.), the price to the country will be the "total cost to the U.S. Government" (9:A.5.b), the purchaser must pay the full cost even if there is an increase in the estimated price shown (9:B.1.), the purchaser must pay termination liability in advance (9:B.3.f.), and the country must accept the liability for any loss or damage incurred by the U.S. Government or its contractors and subcontractors in conjunction with the LOA (9:C.2.).

Where CLSSA Fits

A country must negotiate a separate LOA agreement (or case) for different categories of items. The USAF has 27 different types of cases covering such diverse types of items and services as munitions, maintenance, training films and film strips, publications, and aircraft system sales. (5:9-12,13) These FMS cases fall under three categories--defined order, blanket order, and CLSSA. While these categories may contain agreements for the same items or services, their differing formats and treatments for requisitions make them different case types.

The defined order is characterized by the fact that "...items, services or training to be provided are stated explicitly on the Letter of Offer and Acceptance (DD Form 1513)." (6:7-2) Defined orders are typically used by foreign countries for purchases such as system/package

sales, munitions, ammunition, transportation services, aircraft ferry, and technical data packages. (6:7-3) Defined orders are usually filled through new procurement and accordingly are usually procurement lead time away from being filled.

A blanket order is an "agreement ... for a specific category of items or services with no definitive listing of items or quantities." (6:B-2) This lack of definition is what differentiates blanket orders from defined orders. Blanket orders, like defined orders, are normally filled through new procurement rather than directly from U.S. stocks and must wait the standard procurement lead time. (6:8-9) Foreign countries normally use blanket orders to fill requisitions for such items as spare and repair parts, publications, support equipment, technical assistance services, training, and repair of reparable items. (6:7-3,4)

CLSSAs are designed to provide the country with "responsive and continuous" peacetime support for secondary items. (6:7-5) The feature that accounts for this responsiveness and continuity is that CLSSAs allow a country to "buy into the U.S. logistics system for the purpose of reducing requisition lead time." (12:1-1 b (3)) As a result of this partnership in the U.S. logistics system, the country is entitled to "support equal to that provided U.S. forces assigned the same Force Activity Designator (FAD)." (6:8-10)

The CLSSA Process

The process a country uses to implement a CLSSA, maintain it and requisition items under it is really a two-part process. It consists of a Foreign Military Sales Order (FMSO) I and a FMSO II. The purpose and procedures associated with each of these orders are covered in the following sections.

Establishing a FMSO I. The FMSO I process is the first step in establishing a CLSSA case. It is a forecast of a foreign country's requirements as well as an assessment of the country's investment liability. A FMSO I allows the U.S. to stock items in anticipation of a foreign country's demand, but it is not the actual case against which the items are requisitioned. (12:1-2 b (1)) There are three basic steps in the FMSO I process: initial recommendation, adjustment to the recommendation, and implementation. (13:13-5)

The initial recommendation is almost always provided by the system manager (SM). The SM suggests a spares list for the county based upon cumulative data for the system. The SM returns this recommendation to the International Logistics Center (ILC) where it is processed by a computer software package called the Security Assistance Management Information System (SAMIS). (13:13-6 c) SAMIS is also capable of accepting a country-provided spares forecast as the initial recommendation or converting the country's

previous requisition case history into an initial recommendation. (1:9-1 a) Whatever the source, the initial recommendation is forwarded to the country in the form of reports listing the recommended items and quantities for inclusion in the program, as well as items with part numbers as opposed to National Stock Number (NSN) and other ineligible items that the country must procure through other means. (13:13-6 g,h)

The country then reviews the reports and makes any necessary changes or adjustments. (13:13-6 i) Based upon the adjusted recommendation, the ILC prepares a Letter of Offer and Acceptance (LOA) (DD Form 1513) for the country. (13:13-7 e) The price quoted in the LOA consists of a deposit of 5/17ths of the value of the items and an administrative surcharge of five percent of the 5/17ths deposit. (13:13-3 e)

The implementation of the FMSO I begins after the country returns the LOA along with its initial deposit. As soon as the country's initial deposit is paid to the Security Assistance Accounting Center (SAAC), the ILC can get obligation authority to direct the appropriate sources of supply to buy and stock additional quantities of the items listed in the FMSO I in anticipation of the country's demand. (13:13-8)

FMSO I requirements are handled in one of two ways, dependent upon their Expendability, Recoverability,

Repairability Category (ERRC) Code. (12:7-1) USAF investment items (also called reparables or procurement appropriation secondary items) are handled under Line Item Control (LINC). They are tracked by stock number and quantity throughout the CLSSA process. Investment items must go through a 17-month phase-in period to give the source of supply enough time to stock the item in sufficient quantity to meet the demand forecast in the FMSO I. (13:13-19)

Expense items (also called consumables or stock fund secondary items) are handled under Financial Control (FINC). They are tracked during the CLSSA process in terms of dollar value rather than individual stock numbers and quantities. Since acquisition lead times are generally shorter for expense items, their phase-in period is only 12 months. (13:13-23 b)

FMSO I: Keeping the Case Current. Since the FMSO I is an on-going case, it is necessary to update and renegotiate the case to keep it current. Updates are made as required, and can be initiated either by SAMIS or by the country. SAMIS updates the FMSO I whenever it receives system-wide changes that affect NSNs for investment items. For example, if a stock number is deleted from the USAF logistics system or becomes ineligible for inclusion on the FMSO I, SAMIS will remove it from the country's FMSO I in an update. Other changes may just be modifications in records such as

switching an Interchangeability and Substitution (I&S) group file from one NSN to another. (1:9-5)

The country may also initiate changes to stock levels for expense items in the FMSO I. Using four different SAMIS transactions, the country may add a new item, increase the quantity of an item already on the FMSO I, decrease the quantity, or delete an item. (1:9-6 a to d)

Since a country is financially liable for the value of all the items on its FMSO I (not just the 5/17ths it paid in equity), it must somehow liquidate the liability for items it deletes or for which it decreases the quantity. (12:4-4) This provision of CLSSA is required by the stipulation of the AECA that ensures that the United States Government does not lose any money as a result of the FMS program. (15: sec 21) There are six "drawdown" requisition disposition codes that the country can use to tell the USAF how to go about liquidating the FMSO I liability. Four of the disposition codes indicate that the country wants the USAF to absorb the assets if possible. If the assets cannot be absorbed, the country can have all the assets delivered in their present condition (since LINC items are reparables, some assets may be in other than serviceable condition), have all the assets delivered in serviceable condition, have serviceable assets delivered and the others disposed of by the USAF, or have all the assets disposed of by the USAF. The remaining two options indicate that the country wants all their assets

delivered in serviceable condition even if it takes repairs or new procurement. (12:4-4 a)

When a drawdown requisition is processed and the asset can be absorbed by the USAF, the country's liability is canceled. When an asset cannot be absorbed, the country is charged the stock list price. This cost is reduced by the average repair cost if the item is reparable (as opposed to serviceable). If the country directs USAF disposal, the liability is reduced by the disposal value (1.44 percent of the stock list price). (13:13-15)

Periodically, the FMSO I case value must be renegotiated so that the case value reflects the country's actual requirements for expense items, country adjustments to investment items, and inflation. Under the USAF CLSSA program, the FMSO I is usually renegotiated every six months. (13:13-17) SAMIS reviews the country's requisition history; takes changed prices, additions, and deletions into account; and then produces a renegotiation listing with the computed increase or decrease in the case value. (13:13-18 b) The ILC prepares a Modification to the LOA (DD Form 1513-2) based on the SAMIS listings and forwards it to the country along with a letter explaining the renegotiation and the SAMIS listings which itemize the modifications. (13:13-18 e) If there is any increase in the FMSO I value, the DD Form 1513-2 requires the country to make an additional deposit with SAAC to cover the 5/17ths investment liability

relative to the increase in value. Based upon the increased investment, the appropriate sources of supply can increase their stocks accordingly to cover anticipated requisitions. If there is a decrease in the FMSO I value, the DD Form 1513-2 notifies the country of a decrease in equity and refunds 5/17ths of the decrease in value. In this way, the continuing FMSO I case remains current with the country's needs and demands. (12:2-4,5)

FMSO II: A CLSSA Case In Action. Unlike the FMSO I which forecasts specific item and quantity requirements and assesses investment liability for the forecasted items, the FMSO II does not include specified items and quantities. (6:7-5) Rather than being a continuous case like the FMSO I, the FMSO II depicts the "estimated annual withdrawals from the U.S. supply system." (6:8-10) In addition to the cost of withdrawals, the FMSO II also includes various accessorial and service charges. (6:B-9) Some of these surcharges include transportation, administration, packing, crating, handling, asset use, and storage costs for the on-hand portion of tne FMSO I. (13:13-4 d)

Requisitions associated with the FMSO II are categorized as either programmed or non-programmed. This designation determines how the requisition is treated and can thus influence the response time as well as the cost of the requisition. (12:1-2 e) Separate procedures are used to determine the programmed or non-programmed designation for

expense and investment items. Expense items are coded programmed as long as the requisition is submitted with a recurring demand code (13:13-30 d (1)) and programmed support does not exceed the expense item dollar value on the FMSO I for the past 12 months. (13:13-23 b)

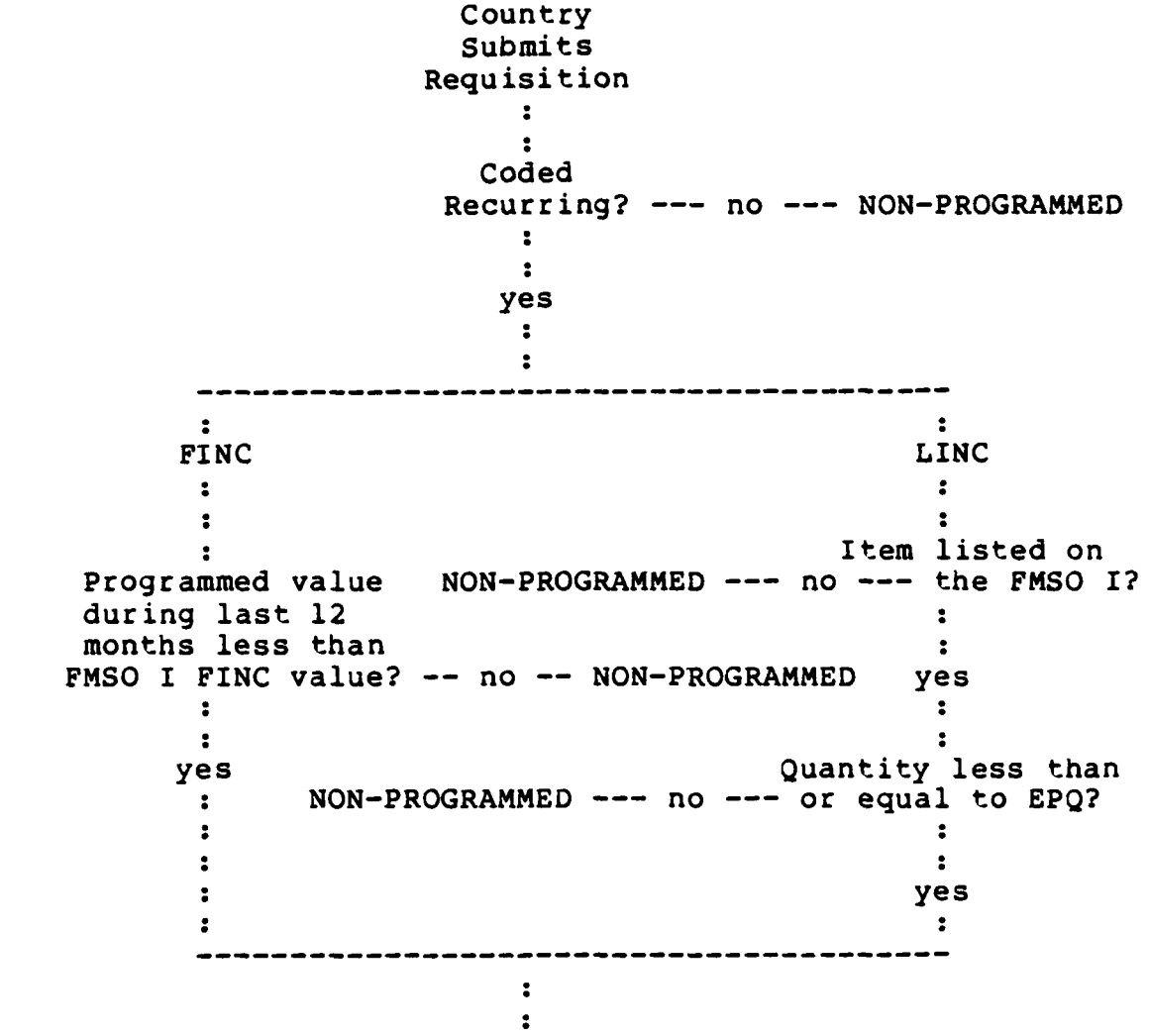


Figure 1-1. Programmed vs Non-Programmed Decision

A requisition for an investment item must meet three criteria to be coded as programmed: (1) it must be submitted with a recurring demand code, (2) the item must be listed on the FMSO I, and (3) the quantity being requisitioned must be less than or equal to the Eligible to be Programmed Quantity (EPQ). (13:13-30 d (2)) Figure 1-1 illustrates the process for determining whether a requisition is coded programmed or non-programmed for both expense and investment items.

TABLE 1-1
Common Transactions and Their Impact on EPQ (13:13-19 d)

Transaction	Immediate Result	17-month Result
Item added to FMSO I	none	(+)
Item deleted from FMSO I	(-)	none
Quantity increase (increase SLQ)	none	(+)
Quantity decrease (decrease SLQ)*		
less than phase-in quantity	none	none
more than phase-in quantity	(-)	none
Programmed Requisition	(-)	(+)
Cancel Programmed Requisition	(+)	none

* When possible, decreases in SLQ comes out of quantities that are undergoing the phase-in period rather than quantities which have already matured and are EPQ.

EPQ is determined through individual tracking of each line item. When the FMSO I is initiated, the 17-month projection for a given line item is its Stock Level Quantity

(SLQ). This SLQ is the upper limit for cumulative EPQ during any 17-month period. (13:13-19 a) Before the SLQ can become the EPQ, however, it must await the 17-month phase-in period. (13:13-19 b) The EPQ fluctuates as modifications are made to the FMSO I and as programmed requisitions are made or canceled. Table 1-1 shows the impact of various transactions on EPQ.

The priority with which a CLSSA requisition is submitted determines how it is handled. Programmed requisitions with Uniform Materiel Movement and Issue Priority System (UMMIPS) priorities 1-8 are filled from USAF stocks down to zero balance. (13:13-30 e (2)) Programmed priorities 9-15 are filled from USAF stocks down to the "support level". This "support level" quantity is calculated to provide minimal readiness support. (13:13-30 e (1)) If a requisition does not qualify as programmed, no matter what its priority is, it is not filled from U.S. stocks if it would drop them below the control level. (13:13-30 e (3)) These non-programmed requisitions must either be ordered from the commercial vendor, or be held on backorder until the stock level climbs above the control level. (13:13-1 b)

Summary and Organization of Thesis

This chapter initially presented the focus of this research, which is to examine the accuracy of the requisition response time claims relative to CLSSA. In

addition, the reader was exposed to procedural aspects of CLSSA, to include a relatively detailed review of the FMSO I and II processes. This background is pertinent to the discussions and research investigations in the remaining chapters.

This thesis is divided into five chapters. Using the background and specialized terminology presented in this chapter, Chapter II concentrates on the proclaimed benefits of CLSSA and what prior research studies have demonstrated in this regard. The methodology for this research--which includes an operational definition for faster requisition response times and the decision rules for evaluating the resultant comparison between programmed and non-programmed requisitions--is presented in Chapter III. An analysis of the findings of this research is contained in Chapter IV, and this analysis is followed by the overall research conclusions in Chapter V.

II. CLSSA Claims and the Verdicts So Far

Chapter Overview

Literature on CLSSAs, other than USAF and DoD directives and manuals, is limited and in many cases somewhat dated. Five of the studies on CLSSA were evaluations of its effectiveness. The earliest of these studies was in 1968, and the most recent in 1980. All five of the studies were Air Force Institute of Technology (AFIT) thesis projects, each of which focused on one of three different measures of effectiveness: delivery source (either new procurement or issued from stock), cost, and response time. This chapter reviews the previous research on CLSSA's effectiveness, the conclusions from these studies, and the applications and implications the earlier work has for this research.

Do Delivery Sources Match Programmed Status?

The question of whether an item is issued from U.S. on-hand stocks or new procurement to fill an FMS requisition is an important consideration in evaluating the effectiveness of CLSSA. Department of Defense policy is that non-programmed sales from inventory will only be made if "the supplying agency considers its stocks more than adequate to meet all requirements of U.S. forces and CLSSA claimants." (8:E.3.) If CLSSA requisitions are filled from on-hand stocks, CLSSA theory suggests that both cost and response

time will decrease. Cost will be lowered because the requisitioned item will benefit from consolidated buys with U.S. demands that earn lower unit prices. (12:1-2) Response time will also benefit since the item doesn't have to go through the procurement pipeline. (13:13-2 c (4)) If, however, non-programmed requisitions are also being filled from on-hand U.S. stocks, the relative advantages of CLSSA participation are diminished.

For their 1980 AFIT thesis, Eugene Chin and Major Robert Heldt, USAF, tested the basic hypothesis that programmed requisitions should be filled from on-hand stocks while non-programmed requisitions should be filled through new procurement. (4:12) To this end, they examined investment items in terms of the percentage of requisitions filled from USAF on-hand stocks and the percentage filled through new procurement. They conducted this analysis for three groupings of data: (1) the general categories of programmed and non-programmed, (2) requisition priorities 1-8 and 9-15 within each category, and (3) programmed and non-programmed requisitions for each of the ALCs. (4:50,51)

For all three facets of their research, programmed requisitions were generally filled from on-hand stocks. Non-programmed requisitions, however, were also generally filled from on-hand stocks. (4:72-74) Their decision rules stipulated that new procurement should exceed on-hand issues for non-programmed requisitions by 68 percent or more if the

CLSSA program were working as expected. (4:54,55) In actuality, the lowest percentage of non-programmed requisitions filled from on-hand USAF stocks recorded in any of their comparisons was over 80 percent. (4:57-59)

Based on these results, Chin and Heldt concluded that "the CLSSA program is not operating as expected." (4:77) Although their research did not specifically examine the issue of fill time differences covered in this research, they suggested from their results that:

> If all spares were generally provided from the same source, it logically follows that there would be no significant difference in cost for the spares nor in the time required to fill the requisition. (4:75-76)

Their unexpected negative evaluation of the CLSSA program and the implications for response time performance supported the need for this research. Their three research objectives (4:12-13) were also helpful in building the framework of this research. In particular, their examination of the performance of CLSSA at each of the ALCs formed an integral part of this research.

Do Programmed Requisitions Cost Less?

Two other AFIT thesis efforts examined the effectiveness of CLSSA using cost criteria. Although these studies did not evaluate CLSSA on the same criteria as this research did, their approach and findings, like those of Chin and Heldt, have direct bearing on the overall

effectiveness of CLSSA and on the need for this research. Since many of the factors which influence cost also influence response time, the variables they examined should also be of interest in this response time research. In addition, their results and conclusions based on CLSSA's cost effectiveness are a relevant reflection on the general condition of the program and should be similar to those found in research based on other measures of CLSSA's effectiveness.

In 1968, Wing Commander Sydney White of the Royal Australian Air Force (RAAF) and Major Frank Logan, USAF, conducted an evaluation of CLSSA. They compared catalog values for a sampling of commercially available spares with the CLSSA costs for those same parts. They found that a foreign country could trim 36.4% off its spares costs by purchasing its spares through CLSSA rather than contracting for them with the commercial vendor. In addition to this theoretical cost effectiveness evaluation, they collected actual data in the form of quotations given the RAAF procurement office for proposed spares purchases and compared them with the CLSSA costs. They found that CLSSA could undercut these price quotations by 50.2%. (16:47-55) Their results led them to conclude that, "there are considerable advantages to be gained by countries participating in the Cooperative Logistics Arrangements." (16:86)

In a subsequent study, Capt John Breed, USAF, and Major James Winn, USAF, compared the costs of programmed and non-programmed requisitions. This comparison evaluated the hypothesis that, "A significant difference exists in final billing prices for programmed versus non-programmed CLSSA requisitions." (2:8) From their evaluation of selected National Stock Numbers (NSNs) (2:28), they found that the difference in final billing price between programmed and non-programmed requisitions for the same item was statistically significant in less than 30 percent of the NSNs. (2:59,60) Accordingly, they concluded that "from the FMS customers' perspective, there is no financial benefit to participate in a CLSSA." (2:59)

These contradictory results from the evaluations of CLSSA using cost criteria added further impetus to this research. This uncertainty over whether or not CLSSA is performing as expected typifies the need for clarification that prompted this research. The implications for the credibility of CLSSA are obviously serious if the negative conclusion of Breed and Winn (2:59) is true. The positive findings by White and Logan (16:86) suggest, however, that further examination of CLSSA's effectiveness is needed to resolve the disparity of the results.

Are Programmed Requisition Response Times Better?

Two 1979 AFIT thesis research efforts evaluated CLSSA in terms of requisition response time. These evaluations

specifically relate to this research in that the hypothesis being tested is the same--programmed requisitions should have faster response times than non-programmed requisitions. (14:13, 3:16) The CLSSA Country Brochure advertises shorter lead times as one of the primary benefits of the CLSSA program. (12:1-2) Since the country forecasts their requirements and pays a deposit so the desired items can be stocked in advance, programmed requisitions should have faster response times. According to Chin and Heldt's hypothesis, these faster response times are the result of programmed requisitions being filled from on-hand stock resulting in shorter requisition response times than for non-programmed items that are filled by new procurement. However, as discussed under their research on delivery source, if non-programmed requisitions are also filled from on-hand stocks, the response time advantage will be relatively diminished. (4:75-76)

The first of these studies, by Kimble Pendley and Capt Griffin Ratley, USAF, tested the basic hypothesis with two research questions: (1) in general, are programmed requisitions filled faster than non-programmed requisitions, and (2) is there a difference in response times for critical items. (14:16) For programmed and non-programmed requisitions in general, they found no statistically significant difference in response times. (14:71) In fact, the mean response time for non-programmed requisitions was

only 0.4 days slower than for programmed requisitions. (14:50) Their results did, however, indicate a significant difference in response times for critical items. The programmed mean response time was 177 days shorter than for non-programmed requisitions. (14:72) They concluded, however, that CLSSA "is not, in reality, functioning according to the designed plan." (14:73)

James Callahan, Major Charles Johnson, USAF, and Colonel Mahmood Moradmand, Imperial Iranian Air Force (IIAF) also evaluated the response time effectiveness of CLSSA. They, too, approached the hypothesis in terms of general programmed versus non-programmed requisitions. They then focused on the influence of Not Mission Capable-Supply (NMCS) status on requisition response time. (3:16) They collected a month's worth of data over two separate months for each of their research questions. In the general comparison, they found that programmed response times were statistically better than non-programmed for both months with significance levels of .0005 and .001 (their rejection decision rule was a significance level of more than .05). (3:64) For the NMCS tests, however, they found programmed response times significantly better during only one month. The statistically significant month had a significance level of .037 while the other month only had a significance level of .258. (3:66) Based upon these results as well as interviews about the program with ILC personnel and Item

Managers (IMs) at the various Air Logistics Centers (ALCs), Callahan, Johnson, and Moradmand concluded that "the results of the fill time hypothesis were not favorable when compared to the contended improvement in supply that is advertised for programmed requisitions." (3:81)

The results from these studies on response time effectiveness suggest that CLSSA is not performing as expected. There were, however, some inconsistencies that needed to be resolved. They both asked the same research question concerning programmed versus non-programmed requisitions in general, yet reached opposite conclusions. Pendley and Ratley found virtually no difference between programmed and non-programmed requisitions in general, and certainly no statistically significant difference (14:50,71), while Callahan, Johnson, and Moradmand found the difference to be statistically different in both of their trials and with a high degree of confidence. (3:64) Internally, the results of these studies also appeared to be inconsistent by not giving the CLSSA program credit for the positive results they found. Callahan, Johnson, and Moradmand had mixed results to the degree that three of their four comparisons supported the hypothesis of faster programmed response times, yet they concluded that CLSSA was not working. (3:64,66,81) Pendley and Ratley found that CLSSA was working for critical items, yet concluded that the overall program was not working. (14:73)

Relevance of Prior Research Efforts

These studies were valuable in helping define the basic framework of this research. However, while the research questions are very similar, there are some key differences in the approaches due to the available methodology. As in these earlier studies (14:15-16, 3:8), this research looked at programmed support relative to non-programmed support in terms of an overall comparison, as well as the more specific comparisons based on requisition priority. Using the comparisons in these earlier studies as a starting point, this research went into more depth, examining not only requisitions of like priorities, but also cases of non-programmed requisitions with higher priorities than the programmed ones. If CLSSA is operating as expected, programmed requisitions should have faster response times in this comparison as well. (13:13-30 e (3))

This research also evaluated the impact of the type of item being requisitioned, either investment or expense, on CLSSA's performance. None of the earlier studies included expense items in their comparisons (2:26, 3:36, 4:45, 14:38) except White and Logan (16:47-48), and even then their analysis focused on cost groupings of the items (16:56) rather than the difference between financial and line-item management.

The increased depth of this research, as indicated by the larger number of variables examined, relative to the

earlier studies, was made possible by data gathering technology that has only recently been made available. Both of the earlier studies on CLSSA's response time performance used the H051 computer system as their data source. (14:34, 3:35) Since their research, the H051 has been replaced by the Security Assistance Management Information System (SAMIS) which was used to collect the data for this research. The earlier researchers were limited by the characteristics of the H051 to collecting their samples from IBM7080 tapes through an interface with the CREATE computer system. (14:35-40, 3:36-39) Instead of this cumbersome methodology into which they were forced, this research was able to use SAMIS, which has a much more extensive capability for data gathering than did the H051. In addition, the ILC has just recently created software packages that compliment this machine capability and enhance the overall availability of CLSSA data. In fact, Fill Time Statistics, the specific program used for this research, was only made available in October 1985.

Summary

Five earlier studies evaluated the effectiveness of CLSSA in terms of delivery source, cost, and response time. Although four of the five studies concluded that overall the CLSSA program was not meeting the expected performance standards suggested by CLSSA theory, the results of their individual tests were mixed. The lack of unanimity in these

earlier research efforts suggested that the question of CLSSA's effectiveness was still in doubt.

The basic frameworks of these earlier studies were instrumental in the formulation of the framework for this research effort. In particular, these evaluations suggested comparisons between programmed and non-programmed requisitions based on source of supply and requisition priority. Chapter III describes how these and other factors were examined in this research effort, how the methods used in this study differ from those used in the earlier studies, and how the results were evaluated.

III. Methodology

Chapter Overview

The purpose of this chapter is five fold. First, it describes the Security Assistance Management Information System (SAMIS) and how the data for this research was extracted from its data base. This chapter then tells how the data from SAMIS was prepared for analysis. Third, this chapter explains the cumulative response rate and chi square methods used to analyze the data. Fourth, it outlines the investigative questions for this research, and finally it describes the decision rules used to develop the findings and conclusions.

Data Collection with SAMIS

The Security Assistance Management Information System (SAMIS), the ILC's computer system that handles and tracks FMS requisitions, was used to collect the response time data for this research on the effectiveness of CLSSA. Specifically, this research used Fill Time Statistics, a standard SAMIS package. Fill Time Statistics is a recent addition to SAMIS that has been available only since October 1985. Its flexible and simple data base interrogation procedures allowed easy isolation and data collection for specific populations of interest. Its standard output was also well-suited to this research. This output from SAMIS presented the factors that this research examined in a

format that required only minor manipulation to prepare it for analysis.

SAMIS collects requisition response time data based on a variety of available selection criteria. Appendix B shows the SAMIS option selection frame where selection criteria are identified to SAMIS. Using these selection criteria, SAMIS can be directed to extract an appropriate data base for each of these research questions. The following descriptions focus on the key options related to this research.

TABLE 3-1
ROUTING IDENTIFIER/SOURCE OF SUPPLY CODES

Routing Identifier Code	Source of Supply
FF	Sacramento ALC
FG	Ogden ALC
FH	Oklahoma City ALC
FL	Warner-Robins ALC
FP	San Antonio ALC

The country activity code tells SAMIS which country's data to extract. If a country activity code is not specified, SAMIS automatically collects data on all participating countries. Routing Identifier is another option that can further define the data to be collected. It indicates the Air Logistics Center (ALC) that filled the requisition. Table 3-1 shows the codes for each of the ALCs.

History start and end dates further defined the data specified by the selection options. SAMIS collects count data on requisitions dated between the indicated dates which also meet the specified criteria. It then fits the data into fill time ranges of 15, 30, 60 or 90 days depending on the indicated fill time range. By extension, the selected range also defines the total width of the fill time range since there are only ten fill time categories for each run. These selection options also appear on the SAMIS output and identify the data in relation to the selection criteria.

Under fill time, the count data is broken out by management category (investment or expense item), type of requisition (programmed, non-programmed, or blanket order), and requisition priority (1-8 or 9-15). The data is presented in three parts: completed shipments, partial shipments, and open requisitions. The completed section gives count data on shipments that were shipped in their entirety. The partial shipments portion of the report gives count data on shipments for which only part of the requisition was shipped during the indicated response time category. The remainder of these partial shipments are either listed in the partial shipments section under another response time category or in the open requisition section. The open requisitions segment gives count data on requisitions that were still unfilled as of the report date.

Specific selection criteria were developed to extract the data base for this research by applying SAMIS's interrogation process and the way in which the data was presented to the investigative questions. For those investigative questions examining the type of item and requisition priority from a general perspective, SAMIS was directed to collect data from all participating countries without any of the specific restrictions. The data on the CLSSA effectiveness of each ALC was identified by the specific routing identifiers presented in Table 3-1. The data for the case studies on individual countries was collected by specifying the country's activity code as one of the selection criteria. Appendix C contains examples of SAMIS output for all participating countries combined (complete, partial, and open listings). Output for a specific ALC or country would be the same, except that the source of supply or country label would be filled in with the selection criteria used instead of being left blank.

Preparing the Data for Analysis

Before analyzing the response times, the count data from all three parts of the report were consolidated. This was necessitated by the fact that without the open requisitions, all the requisitions would not be considered and the fill time distribution would be inaccurately skewed toward earlier responses. Another aspect of preparing the data for analysis was a "time offset" process that was used

in choosing the history start and end dates. This process involved only using data from requisitions that had been submitted more than a year earlier. With the selection criteria in this research, SAMIS differentiated between response times for requisitions up to 360 days old. If the time between the history end date and the report date was not at least equal to 360 days, unfilled requisitions submitted at the end of the history period may not have had an opportunity to be filled and would inappropriately inflate the numbers of open requisitions, while filled requisitions from the same time periods would inaccurately swell the early response time categories. The open requisitions data would be inconclusive since SAMIS would include recent requisitions that are in the process of being filled in the same category as items that are on backorder or are being filled through new procurement.

Since the research data collection was specified by selecting the 30 day fill time range option, the data search yielded a total range of 360 days. Accordingly, to implement this "time offset" process, the most recent samples of requisition response times are for requisitions made during 1984. In light of the one year range of fill times, anything requisitioned during 1984 has since been filled (completely or partially) or is listed as "open" in the "over 360" fill time range. Regardless of when these open requisitions are filled, they would eventually fall

into the "over 360" category. By using this "time offset" process, all requisitions are accounted for without skewing the data.

Analyzing the Data

This research analyzed the response time data using two different techniques, cumulative response rate analysis and chi square analysis. The two methods provided a double-check on the validity of the results. If programmed requisitions really do have faster response times than non-programmed requisitions, then both types of analysis should support that hypothesis.

Cumulative Response Rate Analysis . Cumulative response rate analysis is based on the percentage of a given distribution's requisitions filled in or before a given response time category. The cumulative pecentage for each cell is calculated by dividing the total number of requisitions that have been filled in or before the response time category being examined by the total number of requisitions in the distribution in question. For ease of analysis, the difference between the cumulative percentages for programmed and non-programmed is presented on the comparison output for each response time category.

In order to support the hypothesis that programmed requisitions are filled faster than non-programmed requisitions, the programmed cumulative response rate percentage must be greater than the non-programmed

cumulative response rate percentage in the first nine response time categories (both distributions will always have cumulative response rate percentages of 100 in the last response time category).

Chi Square Analysis. The chi square analysis shows two things: whether or not a statistically significant difference exists, and whether or not the pattern of that difference supports the hypothesis of faster programmed response times. Both portions of the analysis are performed based on a chi square test. The requisition response time data for this research comes from SAMIS divided into ten response time categories. For the purpose of the chi square test, the count data in each of these response time categories is placed into a 2 x 10 matrix under either programmed or non-programmed. The 20 positions in this matrix are called cells. The chi square analysis hinges upon the evaluation of the count data in each of these cells.

The chi square analysis begins by assuming that both distributions are the same and calculates an expected value for each cell based upon that assumption. The expected value for each cell is the number of requisitions that would fall into that response time category and that distribution if this assumption of sameness were true. This expected value is calculated for each cell by multiplying the total number of responses in that cell's response time category

for both distributions by the probability of a response falling into the cell's distribution. This probability is calculated by dividing the total number of responses in the distribution being examined by the total number of responses in the comparison. Each cell's contribution to the total chi square statistic is then calculated by subtracting its expected value from its actual value, squaring the result, and dividing this squared value by the expected value. The larger the deviation of actual from expected, the larger the chi square statistic for that cell will be, and the less likely it is that the two distributions are the same.

The first portion of the chi square analysis is determining if the two distributions are statistically different. This is done by summing the contributions to the chi square statistic by all the cells and evaluating the resulting total against a critical chi square value. This critical value is determined based upon the desired significance level and the degrees of freedom for the matrix being evaluated. For the purpose of this research, the required significance level is .005 (99.5% confidence). The degrees of freedom are calculated by the formula: (rows in the matrix - 1) x (columns in the matrix - 1). This means that the Chi Square statistic for the matrix has nine degrees of freedom. In the case of this research, the chi square statistic for the whole 2 x 10 matrix must be greater than 23.5893 in order to conclude that the distributions are statistically different with a significance level of .005.

The second portion of the chi square analysis is a cell by cell evaluation that looks at the pattern and magnitude of the differences between the actual and expected values. While the first portion of the chi square analysis indicates whether or not the two distributions are statistically different, this portion of the analysis indicates whether or not the nature of the difference, if one is proven to exist, supports the hypothesis of faster programmed requisition response times. Two distributions may be significantly different, but unless the distributions are consistently skewed to one end or the other of the response time spectrum, the difference is not significant to evaluating the basic response time hypothesis.

If the hypothesis of faster programmed response times is true, then the actual values for the programmed cells should exceed the expected values in the earliest response time categories while the actual values for the non-programmed cells should exceed the expected values in the slowest response time categories. This would indicate a programmed distribution that is skewed toward faster than expected response times and a non-programmed distribution that is skewed toward slower than expected response times.

Using the Computer to Perform Analysis

Part of this research was building a Fortran program to perform both types of analysis on data files containing the count values for the various distributions being compared.

The resulting program and it subroutines are shown in Appendix D along with several other programs designed to input the data and prepare it for analysis. The program's output for the cumulative response rate analysis shows each response time category's cumulative response rate percentage for both the programmed and non-programmed distributions as well as the difference between the two percentages. For the chi square analysis, the output shows the actual and expected values for each cell along with the resulting contribution to the chi square statistic for the cell. It then gives the total chi square statistic for the entire matrix. Internal documentation interspersed with the computer code itself explains the logic and specific directions for these programs.

Investigative Questions

This research investigated CLSSA's performance in terms of three variables: (1) type of item being requisitioned, either investment (line item controlled) items or expense (financial controlled) items, (2) requisition priority, and (3) ALC filling the requisition. The basic hypothesis for this research is that programmed requisitions have faster response times than non-programmed requisitions. If CLSSA is performing as expected, then this basic hypothesis should hold true when examined in the context of each of these variables.

Type of Item Being Supported. The earlier research on the effectiveness of CLSSA has concentrated on the effectiveness of requisitions for investment items and has ignored CLSSA's effectiveness for expense items. (2:26, 3:36, 4:45, 14:38) This was made necessary by the nature of the earlier researchers' data gathering methods. (3:35, 14:34) With the data gathering power of SAMIS, this research was also able to look at this aspect of CLSSA's effectiveness.

To examine this variable, this research answered two questions: (1) Do programmed requisitions have faster response times than non-programmed requisitions for investment items? and (2) Do programmed requisitions have faster response times than non-programmed requisitions for expense items? Overall, the answers to these questions will also show whether or not the type of item being supported has an impact on the issue of programmed versus non-programmed support.

Requisition Priority. The requisition priority variable has been the focus of much of the prior research. (3:16, 4:50-51, 14:16) This research examined the impact of requisition priority on the relative performances of programmed and non-programmed requisitions by examining three requisition response time comparisons: (1) programmed priorities 1-8 versus non-programmed priorities 1-8, (2) programmed priorities 9-15 versus non-programmed priorities

9-15, and (3) programmed priorities 9-15 versus non-programmed priorities 1-8.

Although this third comparison appears to be inappropriate, this researcher submits that it is, a key test of the theoretical performance of CLSSA. If the CLSSA program is operating in accordance with the DoD and USAF regulations and directives, programmed requisitions of all priorities should have faster requisition response times than non-programmed requisitions regardless of their priority. (13:13-30 e (3)) The investigative questions for the requisition priority variable asked if the basic hypothesis of faster programmed response times was true for each of the three comparisons for investment items and for expense items. Overall, the answers to the investigative questions associated with these six comparisons indicate whether or not the requisition variable is a factor in CLSSA's conformance with the basic hypothesis.

ALC Filling the Requisition. This research examined the effectiveness of CLSSA at each of the ALCs by making the two overall programmed versus non-programmed comparisons and the six requisition priority comparisons. These comparisons show where CLSSA is or is not working as expected, and in general determines if the source of supply variable is significant to the basic question of whether or not programmed requisitions have faster response times than non-programmed requsitions.

In the chi square analysis of the ALCs, four of the comparisons for the 1984 data and nine of the comparisons for the 1980 data encountered a limitation of the chi square test that requires an expected value of five or more in each cell of the matrix being evaluated. In those cases, the chi square test would have been inappropriate. For those comparisons, the answer to the investigative questions were determined on the basis of the cumulative response rate analysis alone.

Validation of Results in Country Case Studies

As a validation of this evaluation of the effectiveness of CLSSA, case studies of individual countries were used to explore the question of whether or not a country's participation level in CLSSA (measured in terms of the percentage of programmed requisitions by number) is reflected in its requisition response times. This research asked two investigative question in each of the case studies: (1) do the country's programmed requisitions have faster response times than the country's non-programmed requisitions? and (2) does the country's overall distribution of both programmed and non-programmed requisitions reflect its participation rate in CLSSA when compared against requisitions worldwide? Although the conditions upon the release of the data for this research restrict the release of country names with any of the data, participation rates for 32 unnamed U.S. Air Force CLSSA

customer countries are shown in Table 3-2 for expense and investment items.

TABLE 3-2
CLSSA Participation Rates
(For 32 U.S. Air Force CLSSA Customer Countries)

INVESTMENT ITEMS		EXPENSE ITEMS	
Number	Value	Number	Value
0.00	0.00	99.29	99.71
2.49	1.16	90.99	91.14
3.91	0.96	97.43	96.13
6.13	3.44	98.83	96.87
6.31	1.74	98.47	94.69
7.14	17.53	99.29	99.96
11.27	20.64	99.69	99.90
11.47	12.71	88.78	66.37
13.40	8.27	84.48	99.24
13.52	17.33	98.91	98.22
14.85	12.02	99.15	98.91
14.92	10.77	97.94	90.80
16.10	18.96	97.79	88.51
16.41	15.73	72.13	77.53
18.05	5.93	100.00	100.00
20.73	8.36	98.51	98.29
20.83	19.36	98.99	99.46
20.92	18.01	99.50	99.92
21.32	41.23	98.74	98.82
21.50	10.39	98.47	96.44
21.92	12.40	98.93	99.16
24.24	7.71	100.00	100.00
30.25	34.46	98.62	99.94
31.20	30.51	99.32	99.46
36.30	27.16	99.56	99.20
48.50	24.04	99.31	98.78
52.74	51.09	99.44	99.90
53.21	20.99	98.92	99.53
53.57	48.33	100.00	100.00
59.23	32.88	81.64	78.89
62.07	35.76	98.73	94.59
64.35	41.47	98.13	95.21
Worldwide Averages: 33.08	21.82	95.41	90.02

These participation rate percentages are presented in terms of both number of requisitions and their value. Since the most variation in participation occurs for investment items, which are anywhere from 0 to 64 percent verses 72 to 100 percent for expense items, this research used comparisons based on investment items only.

The four countries used in the case studies were selected based on two key criterion: (1) they had to have active programs so that there would be enough data to be able to draw significant results, and (2) they also had to have extreme participation rates, either high or low to best highlight the difference that participation rate can make. Of the four contries, each had at least 16,000 requistions during the one-year period evaluated in this research. This number of requisitions yielded significant results for both types of analysis in all the country comparisons. The two countries at the low end of the participation rate spectrum had investment item participation rates of 16.10 and 11.47 percent while the two countries at the high end of the spectrum had rates of 64.35 and 62.07 percent.

Decision Rules

Based upon the outcomes of the various programmed versus non-programmed comparisons, this thesis will draw conclusions concerning the three variables, (1) type of item requisitioned, (2) requisition priority, and (3) ALC filling the requisition. The following decision rules outline the

determination of whether or not CLSSA is working as expected.

Investment or Expense Items. The basic question associated with this variable is: Do programmed requisitions have faster response times than non-programmed requisitions regardless of whether the item is an expense or an investment item? The two comparisons that answer this question most directly are those for all programmed versus all non-programmed for each category of items. In order to conclude that CLSSA is operating as expected in terms of this variable, both comparisons had to show that programmed requisitions had the faster response times. This general conclusion was, however, qualified by the other comparisons in which the type of item being supported was examined. For example, although CLSSA performed as expected in the comparisons for expense items overall and in terms of requisition priority, there were some indications that expense items were not getting appropriate treatment when examined in terms of given ALCs. These results were accordingly noted and analyzed in the conclusion relating to type of item being supported.

Requisition Priority. The basic question associated with this variable is: Do programmed requisitions have faster response times than non-programmed requisitions regardless of the priority with which the requisition is submitted? The three comparisons that go into answering

this question are (1) programmed and non-programmed requisitions with priorities 1-8, (2) programmed and non-programmed requisitions with priorities 9-15, and (3) programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8. All three of these comparisons were performed for each category of items seperately. In order to conclude that CLSSA is operationg as expected in terms of the investment or expense subset of the requisition priority variable, all three comparisons had to support the hypothesis of faster programmed response times. In turn, both the investment and the expense comparisons had to show that CLSSA was working as expected in order to further conclude that CLSSA was working as expected based on requisition priority. These results from the overall comparisons were also examined in terms of the results from each of the ALCs to determine this variable's impact in conjunction with that of the source of supply variable.

ALC Source of Supply. The basic question associated with this variable is: Do programmed requisitions have faster response times than non-programmed requisitions regardless of the ALC filling the requisition? In order to conclude that this variable was not a factor, all the ALCs had to have similar performance profiles in terms of the eight comparisons conducted on the data from each ALC.

Summary

This chapter described SAMIS and the methods used to gather the data for this research effort. It then explained the chi square and cumulative response rate methods used to evaluate the data. It also outlined the basic research questions and the corresponding specific investigative questions. Finally, it defined the decision rules used to draw conclusions from the results. Chapter IV presents the results achieved in this research effort using the methods described in this chapter.

IV. Analysis

Chapter Overview

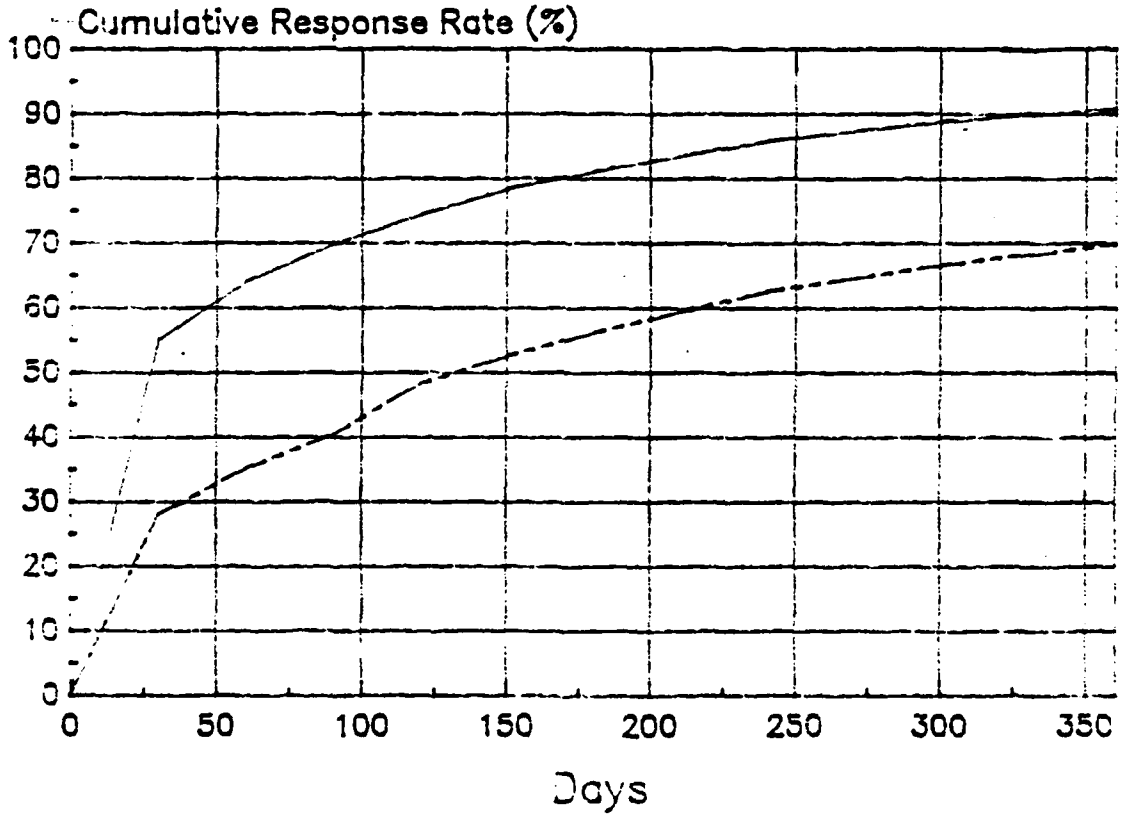
This chapter presents the results of the analysis for each of the three variables covered in this research. It summarizes the results of cumulative response rate analysis and chi square analysis. The chapter presents this analysis for a series of comparisons based on type of item and its corresponding style of management control, requisition priority, and source of supply. Each section contains the results based on those requisitions submitted in 1984. Results from 1980 are included in each section to amplify the 1984 results and serve as a base line.

Type of Items: Investment and Expense

This section contains the overall comparisons between programmed and non-programmed requisitions for investment (line item controlled) items and expense (financial control) items. These comparisons were used by this research to answer the investigative question of whether or not programmed requisitions have faster response times than non-programmed ones regardless of the type of item being requisitioned.

Investment Items: All Priorities. In this comparison, the cumulative response rate analysis showed the programmed distribution to have higher cumulative response rate percentages in the first nine response time categories, thus

supporting the hypothesis of faster programmed response times. The difference between the programmed and non-programmed cumulative response rate percentages in this comparison ranged from a high of 29.44 percent in the 61 to 90 days response time category to a low of 21.01 percent in the 301 to 360 days response time category. Figure 4-1 portrays these differences graphically.

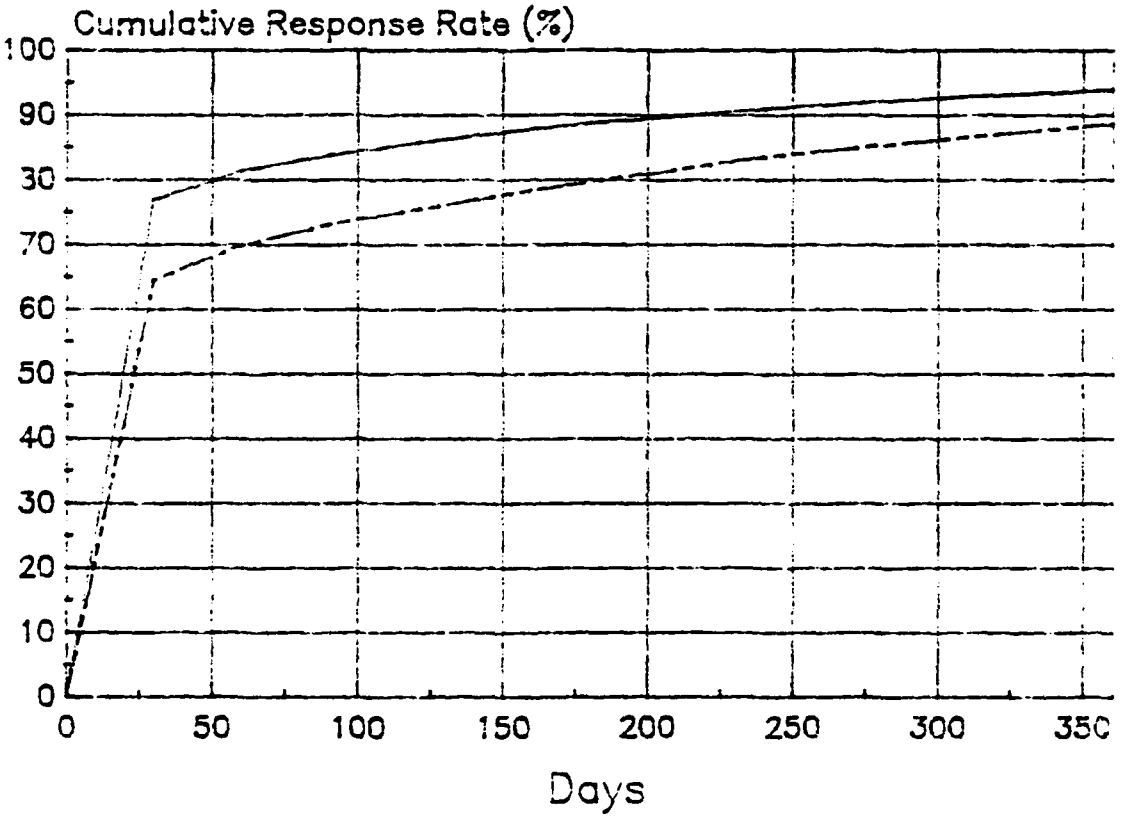


Programmed _____ Non-Programmed - - -

Figure 4-1. Investment Items (All Priorities)

In terms of the chi square analysis, the total chi square statistic for the 2 x 10 matrix was 2565.97 which

cumulative response rates between programmed and non-programmed for that comparison were consistently high, ranging from 17.90 to 20.71 percent higher for the programmed. The 1980 results coupled with the results for 1984 suggest that CLSSA is continuing a trend of providing programmed requisitions appropriate support in terms of this overall comparison of requisition response times.



Programmed ——— Non-Programmed - - -

Figure 4-2. Expense Items (All Priorities)

Expense Items: All Priorities. In the overall expense item comparison, the cumulative response rate analysis

exceeded the critical value of 23.5893, thus indicating that the distributions are different. A cell by cell analysis of tne chi square test for this comparison showed that for both the programmed and non-programmed distributions, the cells with the largest contributions to the total chi square statistic were in the first and the last requisition response time categories. In the first category, the programmed cell exceeded the expected value for a contribution to the chi square statistic of 745.0057 while the non-programmed cell fell short of the expected value contributing 422.8470 to the chi square statistic. Conversely, in the last response time category, it was the non-programmed cell that exceeded the expected value while the programmed distribution fell below the expected number of responses in this category. Their contributions to the chi square statistic were 752.5483 and 427.1282 respectively. The magnitude and positioning of these contributions to the chi square statistic indicate that the programmed distribution is skewed toward the fastest response time category while the non-programmed distribution is skewed toward the slowest response time category. The results from both types of analysis suggest that CLSSA was performing as expected in terms of this overall comparison for investment requisitions of all priorities.

These results were supported by the 1980 overall comparison for investment items. The differences in the

indicated that the programmed distribution had higher cumulative response rate percentages in each of the first nine response time categories, thus supporting the basic hypothesis of faster programmed response times. The differences between the programmed and non-programmed cumulative response rate percentages in this comparison ranged from a high of 12.42 percent in the 0 to 30 days response time category to a low of 5.27 percent in the 301 to 360 days response time category. Figure 4-2 portrays these differences graphically.

The cumulative response rate analysis showed the programmed distribution to have higher cumulative response rate percentages in the first nine response time categories, thus supporting the hypothesis of faster programmed response times.

In terms of the chi square analysis, the total chi square statistic for the 2 x 10 matrix was 943.306 which exceeded the critical value of 23.5893, thus indicating that the distributions are different. A cell by cell analysis of the chi square test for this comparison showed that for both the programmed and non-programmed distributions, the cells with the largest contributions to the total chi square statistic were in the first and the last requisition response time categories. In the first category, the programmed cell exceeded the expected value for a contribution to the chi square statistic of 15.3093 while

the non-programmed cell fell short of the expected value contributing 175.4276 to the chi square statistic. Conversely, in the last response time category, it was the non-programmed that exceeded the expected value while the programmed distribution fell below the expected number of responses in this category. Their contributions to the chi square statistic were 32.4111 and 371.3957 respectively. The magnitude and positioning of these contributions to the chi square statistic indicate that the programmed distribution is skewed toward the fastest response time category while the non-programmed distribution is skewed toward the slowest response time category. The results from both types of analysis suggest that CLSSA was performing as expected in terms of this overall comparison for expense requisitions of all priorities.

The 1980 overall comparison for expense items indicated that CLSSA was working as expected for expense requisitions as a whole. The cumulative response rate ranged from a high in tne first response time category of 9.10 percent to a low of 1.95 in the 301 to 360 days response time category. Taken together, the results from both years suggest that CLSSA has in the past supported programmed requisitions for expense items in general with faster response times than for non-programmed requisitions, and that it continues to provide the expected support in terms of this comparison.

Requisition Priority

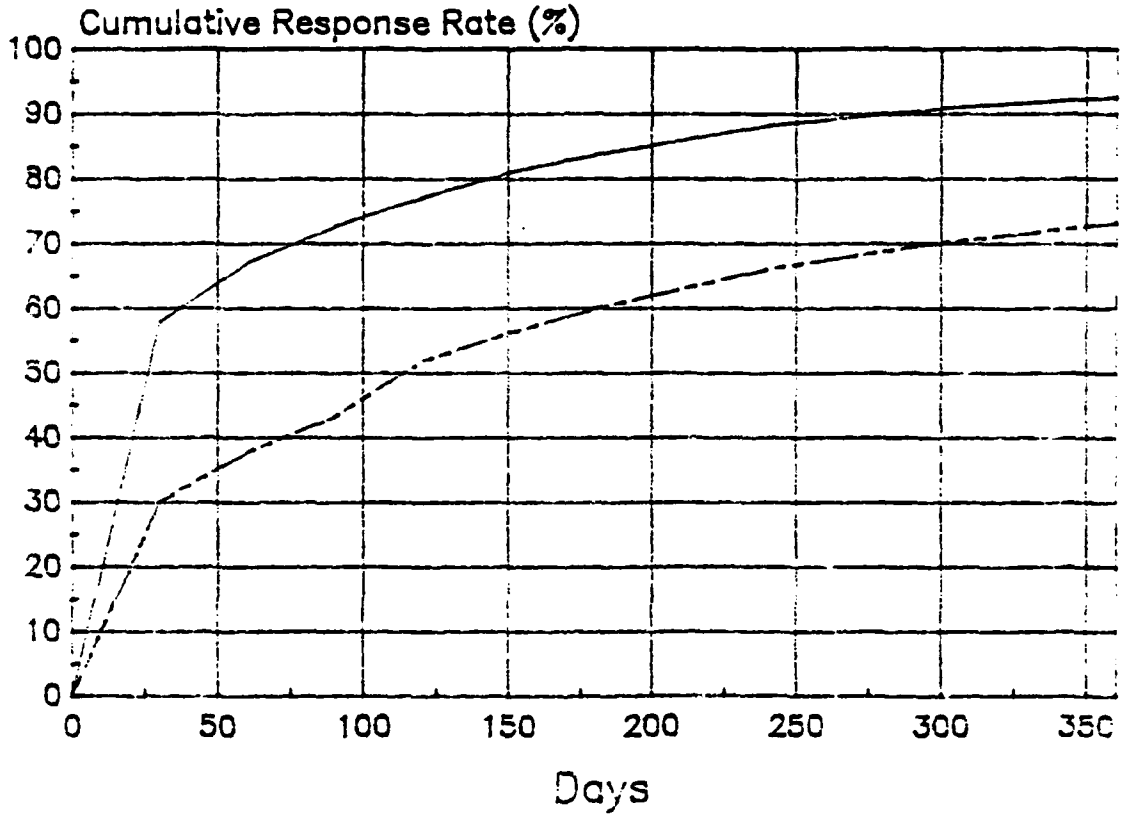
This portion of the analysis consists of those overall comparisons based on the priority with which the requisition is submitted. These comparisons are further divided by type of item, investment (I) or expense (E). This research used these comparisons to answer the investigative question of whether or not programmed requisitions have faster response times than non-programmed ones regardless of the priority with which they are submitted.

TABLE 4-1
Analysis Summary for Requisition Priority (1984)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	21.01	29.44	2565.97
I	1-8	1-8	19.39	29.52	1966.42
I	9-15	9-15	19.70	23.36	400.883
I	9-15	1-8	10.00	14.94	190.637
E	All	All	5.27	12.42	943.306
E	1-8	1-8	6.54	16.68	1163.22
E	9-15	9-15	3.73	7.66	133.013
E	9-15	1-8	4.85	11.15	479.035

All six comparisons based on requisition priority supported the hypothesis of faster programmed response times. In each of these comparisons, the cumulative response rate analysis showed the programmed distribution to have higher cumulative response rate percentages in the first nine response time categories. As indicated by the data in table 4-1, the differences between the programmed

and non-programmed cumulative response rate percentages in these comparisons ranged from a high of 29.52 percent in the investment item comparison for requisitions with priorities 1-8 to a low of 3.73 percent in the expense item comparison for requisitions with priorities 9-15. Figures 4-3 through 4-8 illustrate these differences.

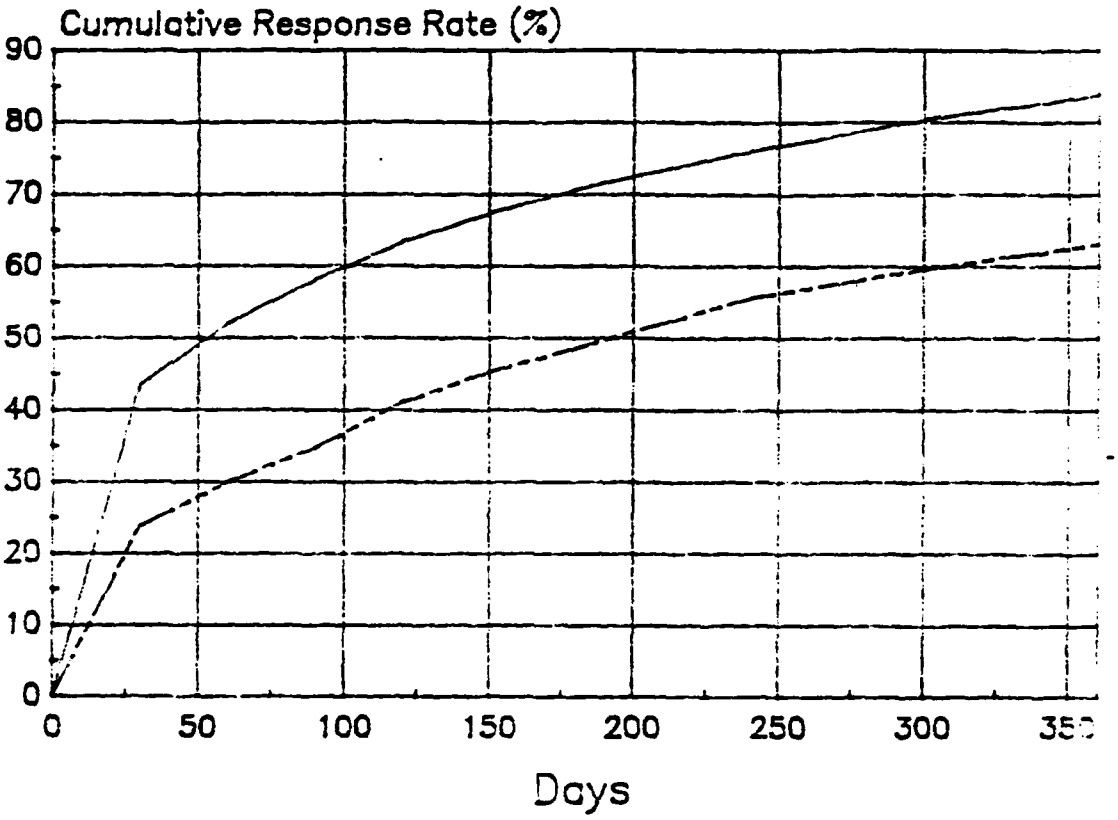


Programmed _____ Non-Programmed - - -

Figure 4-3. Investment Items (Priorities 1-8)

In terms of the chi square analysis, the total chi square statistic for each of the comparisons exceeded the critical value of 23.5893, thus indicating that there was a

statistical difference between the programmed and non-programmed distributions in all cases. The chi square statistics for these comparisons are listed in table 4-1.

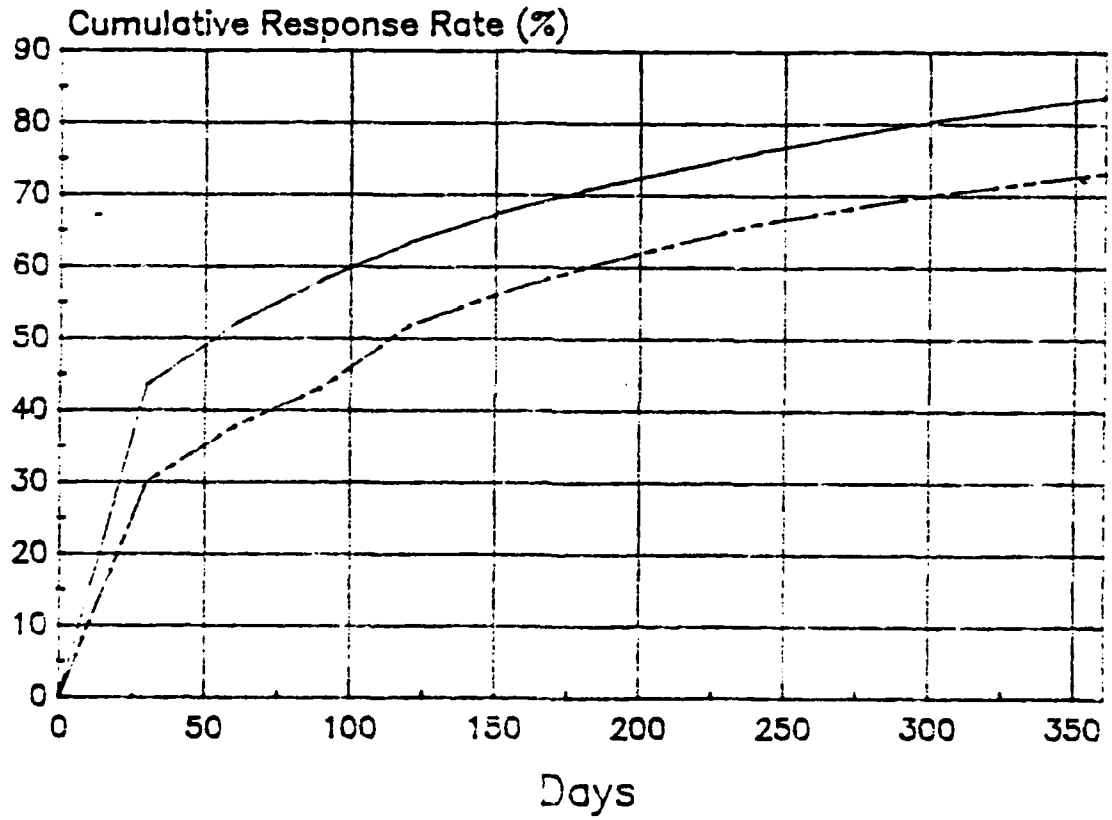


Programmed ——— Non-Programmed - - -

Figure 4-4. Investment Items (Priorities 9-15)

The cell by cell analysis portion of the chi square test showed that at the faster end of the response time spectrum, the actual values in the programmed cells exceeded the expected values while the actual values for the non-programmed cells fell short of the expected values. Conversely, at the slower end of the response time spectrum, it was the actual values for the non-programmed cells that

exceeded the expected value while the actual values in the programmed distributions fell below the expected number of responses. In all the comparisons, this cell by cell analysis indicated that the programmed distributions were skewed toward the fastest response time category while the non-programmed distributions were skewed toward the slowest response time category.

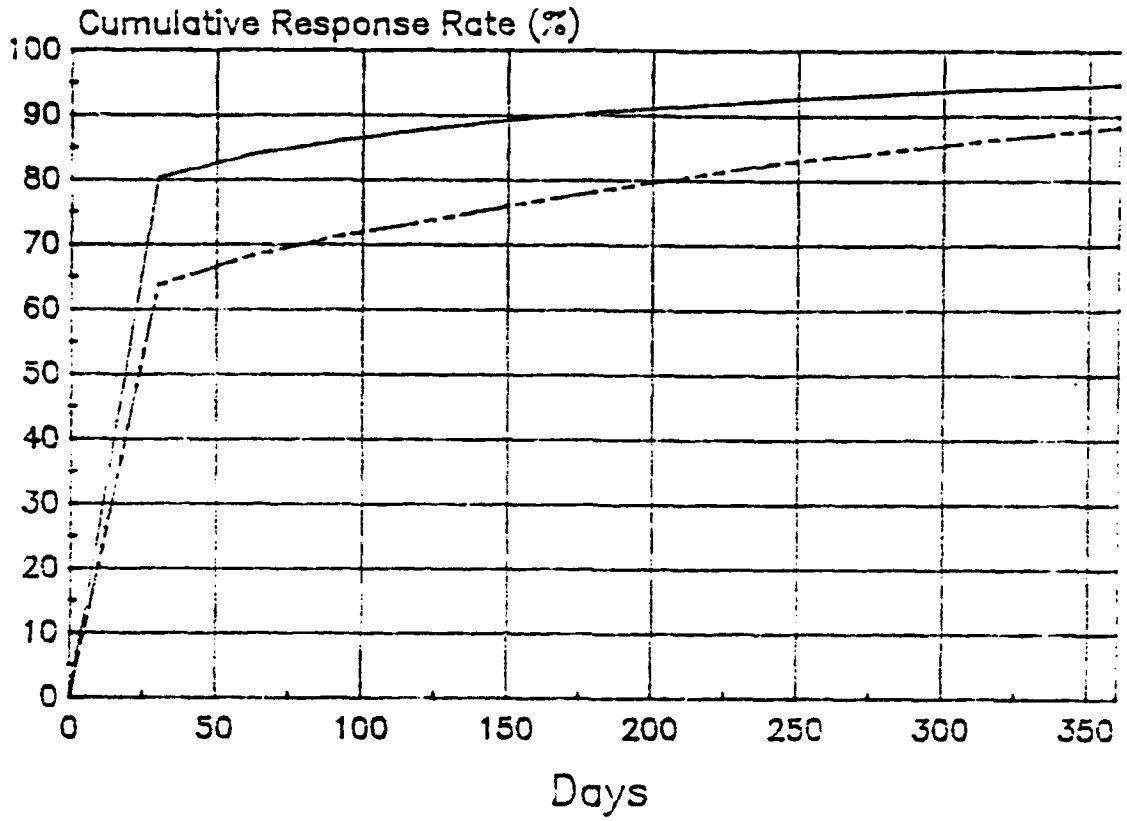


Programmed _____ Non-Programmed - - -

Figure 4-5. Investment Items (Programmed Priorities 9-15 versus Non-Programmed Priorities 1-8)

The results from the cumulative response rate analysis and from the chi square analysis suggest that CLSSA was

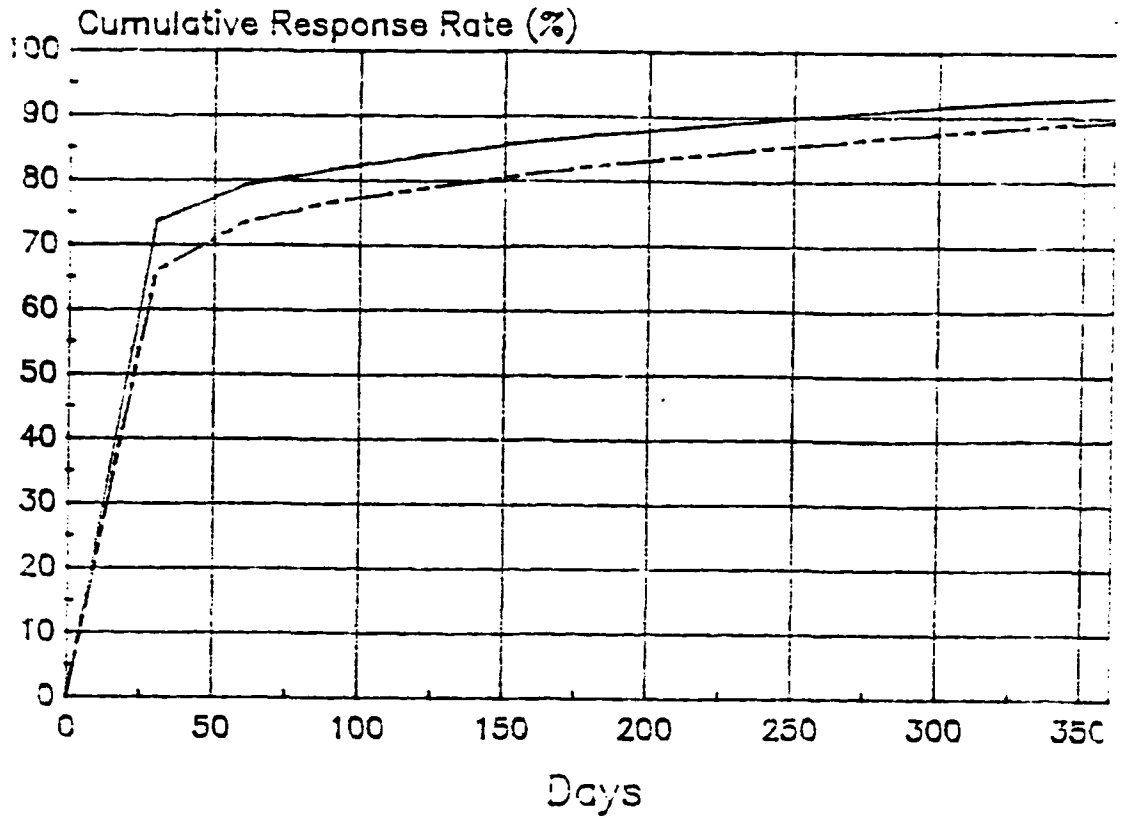
performing as expected in these comparisons. Overall, CLSSA requisitions have appropriate response times based on requisition priorities.



Programmed _____ Non-Programmed - - -

Figure 4-6. Expense Items (Priorities 1-8)

The results from the parallel comparisons for 1980 suggest that investment items are continuing a trend of performing as expected in terms of the requisition priority variable. The 1980 overall comparisons for investment items show that programmed requisitions have the faster response times regardless of the requisition priority with which the programmed and non-programmed requests are submitted.



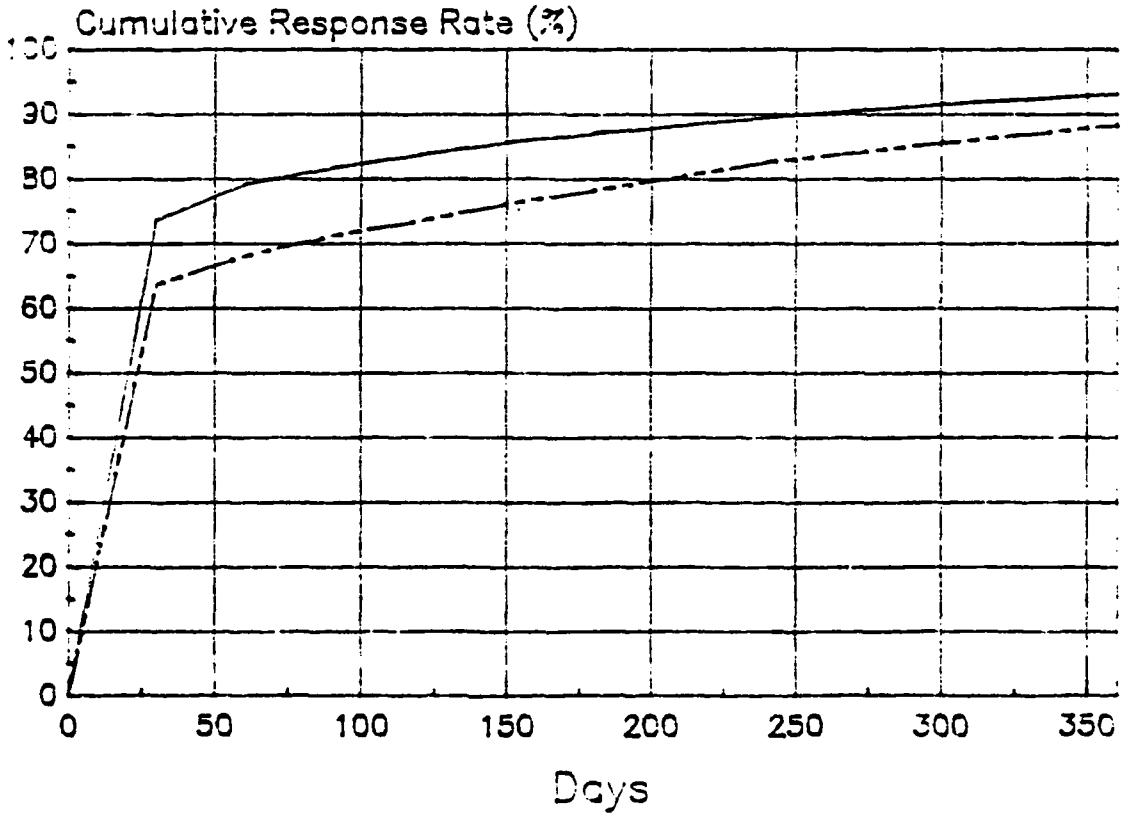
Programmed _____ Non-Programmed - - -

Figure 4-7. Expense Items (Priorities 9-15)

In terms of expense items, however, the two sets of parallel comparisons suggest that the priority variable had an influence on the performance of programmed requisitions in the overall comparisons. In particular, the 1980 results showed that in the comparison between programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8, CLSSA did not perform as expected. In fact, the non-programmed cumulative response rate in that comparison exceeded the programmed rate in all but one of the response time categories, and by as much as 2.72 percent.

TABLE 4-2
Analysis Summary for Requisition Priority (1980)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences Minimum	Response Rate Differences Maximum	Chi Square Statistic
I	All	All	17.90	20.71	725.874
I	1-8	1-8	20.35	23.66	454.920
I	9-15	9-15	15.56	18.68	310.870
I	9-15	1-8	10.97	16.71	238.034
E	All	All	1.95	9.10	333.517
E	1-8	1-8	0.90	3.48	33.4026
E	9-15	9-15	2.88	14.33	427.379
E	9-15	1-8	-2.72	.21	36.4483



Programmed _____ Non-Programmed - - -

Figure 4-8. Expense Items (Programmed Priorities 9-15 versus Non-Programmed Priorities 1-8)

This implies that in the 1980 time frame the U.S. Air Force CLSSA program as a whole was, contrary to Department of Defense policy, responding to high priority non-programmed requisitions faster than low priority programmed requisitions. By 1984, however, this problem appears to have been corrected.

Source of Supply

The subsets of this section relate to a given ALC in terms of the two other variables, type of item being supported and requisition priority. This research used these comparisons for each ALC to determine if CLSSA was working as expected at that ALC, and overall if the ALC filling the requisition is a significant variable in CLSSA's performance.

Sacramento ALC (FF). All eight comparisons performed on the various subsets of requisitions for the Sacramento ALC supported the hypothesis of faster programmed response times. In each of these comparisons, the cumulative response rate analysis showed the programmed distribution to have higher cumulative response rate percentages in the first nine response time categories. As indicated by the data in table 4-3, the differences between the programmed and non-programmed cumulative response rate percentages in these comparisons ranged from a high of 37.38 percent in the investment item comparison between requisitions with priorities 9-15 to a low of 2.48 percent in the expense item comparison between requisitions with priorities 9-15.

TABLE 4-3
Analysis Summary for Sacramento ALC (1984)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	32.63	37.05	292.246
I	1-8	1-8	30.80	36.53	193.292
I	9-15	9-15	33.88	37.38	*
I	9-15	1-8	27.45	33.15	*
E	All	All	6.53	15.10	259.477
E	1-8	1-8	9.57	22.72	296.611
E	9-15	9-15	2.48	6.36	41.2898
E	9-15	1-8	9.33	21.16	247.312

* - One or more cells had expected values less than five, therefore, the chi square analysis could not appropriately be performed for this comparison.

In terms of the chi square analysis, two of the comparisons did not meet the criteria for the chi square test of having an expected value of at least five in each of the cells. Accordingly, the chi square test could not appropriately be performed for the investment item comparison for priorities 9-15 nor for the investment item comparison between programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8. However, of the six comparisons that did meet this criteria, the total chi square statistic for each exceeded the critical value of 23.5893, thus indicating that there was a statistical difference between the programmed and non-programmed distributions in these six cases. The chi square statistic for each of these comparisons are listed in table 4-3.

The cell by cell analysis portion of the chi square test showed that at the faster end of the response time spectrum, the actual values in the programmed cells exceeded the expected values while the actual values for the non-programmed cells fell short of the expected values. Conversely, at the slower end of the response time spectrum, it was the actual values for the non-programmed cells that exceeded the expected value while the actual values in the programmed distributions fell below the expected number of responses. In the six comparisons for which the chi square test was appropriate, this cell by cell analysis indicated that the programmed distributions were skewed toward the fastest response time category while the non-programmed distributions were skewed toward the slowest response time category.

The results from both the cumulative response rate analysis and the chi square analysis, for those comparisons that met the necessary criteria, suggest that CLSSA was performing as expected in terms of these comparisons for the Sacramento ALC.

The results for the parallel comparisons for 1980 show that the Sacramento ALC continues to support the basic hypothesis in all four comparisons for investment items as it did in 1980. In terms of expense item comparisons, however, the Sacramento ALC improved on its 1980 performance by supporting the hypothesis of faster programmed response

times in the comparison for programmed requisitions with priorities 9-15 versus non-programmed requisitions with priorities 1-8. In 1980, the non-programmed cumulative response rate exceeded the programmed rate in five of the response time categories in this comparison. By 1984, the programmed rate exceeded the non-programmed rate in all response time categories, with differences of at least 9.33 percent and ranging as high as 21.16 percent.

TABLE 4-4
Analysis Summary for Sacramento ALC (1980)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	17.22	26.24	158.425
I	1-8	1-8	17.31	27.72	76.6989
I	9-15	9-15	17.43	26.09	90.0950
I	9-15	1-8	16.00	21.66	79.4117
E	All	All	3.99	14.65	124.152
E	1-8	1-8	0.15	1.50	*
E	9-15	9-15	5.53	22.14	*
E	9-15	1-8	-1.55	0.80	*

* - One or more cells had expected values less than five, therefore, the chi square analysis could not appropriately be performed for this comparison.

Ogden ALC (FG). Seven of the eight comparisons performed on the various subsets of requisitions for the Ogden ALC supported the hypothesis of faster programmed response times. In the seven comparisons that supported the hypothesis, the cumulative response rate analysis showed the programmed distribution to have higher cumulative response

rate percentages in the first nine response time categories. However, in the expense item comparison for requisitions with priorities 9-15, the cumulative response rate was actually higher for the non-programmed distribution in six of the nine response time categories. For the seven comparisons that supported the hypothesis, the differences between the programmed and non-programmed cumulative response rate percentages ranged from a high of 29.02 percent in the investment item comparison for requisitions of all priorities to a low of 1.22 percent in the expense item comparison for requisitions with programmed priorities 9-15 and non-programmed priorities 1-8. The cumulative response rates for the other comparisons are shown in table 4-5.

In terms of the chi square analysis, two of the comparisons did not meet the criteria for the chi square test of having an expected value of at least five in each of the cells. Accordingly, the chi square test could not appropriately be performed for the expense item comparison for priorities 1-8 nor for the expense item comparison between programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8. However, of the six comparisons that did meet this criteria, the total chi square statistic for each exceeded the critical value of 23.5893, thus indicating that there was a statistical difference between the programmed and non-

programmed distributions in these six cases. The chi square statistic for each of these comparisons are listed in table 4-5.

TABLE 4-5
Analysis Summary for Ogden ALC (1984)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	22.64	29.02	369.361
I	1-8	1-8	21.57	28.80	278.519
I	9-15	9-15	18.78	24.25	66.3808
I	9-15	1-8	11.12	16.56	38.7926
E	All	All	2.13	5.39	29.3182
E	1-8	1-8	2.94	10.16	*
E	9-15	9-15	-2.15	1.26	*
E	9-15	1-8	1.22	5.78	26.7391

* - One or more cells had expected values less than five, therefore, the chi square analysis could not appropriately be performed for this comparison.

The cell by cell analysis portion of the chi square test showed that at the faster end of the response time spectrum, the actual values in the programmed cells exceeded the expected values while the actual values for the non-programmed cells fell short of the expected values. Conversely, at the slower end of the response time spectrum, it was the actual values for the non-programmed cells that exceeded the expected value while the actual values in the programmed distributions fell below the expected number of responses. In the six comparisons for which the chi square test was appropriate, this cell by cell analysis indicated

that the programmed distributions were skewed toward the fastest response time category while the non-programmed distributions were skewed toward the slowest response time category.

TABLE 4-6
Analysis Summary for Ogden ALC (1980)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	16.35	20.68	78.5899
I	1-8	1-8	17.12	21.72	*
I	9-15	9-15	17.62	21.61	47.2599
I	9-15	1-8	10.65	23.30	51.3708
E	All	All	1.97	7.33	58.0501
E	1-8	1-8	-0.34	2.44	14.8425
E	9-15	9-15	6.06	20.26	*
E	9-15	1-8	-7.13	-1.96	25.5126

* - One or more cells had expected values less than five, therefore, the chi square analysis could not appropriately be performed for this comparison.

These results indicate that CLSSA was not performing as expected for the Ogden ALC in terms of expense item requisitions with priorities 9-15. Overall, expense item requisitions filled by the Ogden ALC did not appear to be receiving appropriate support. In addition to the fact that one of the expense comparisons failed to meet the decision criteria, the remaining successful comparisons had consistently low response rate differences. Despite passing both types of analysis, the highest response rate difference in the three remaining comparisons was only 10.16. The

results did, however, indicate that investment item requisitions filled through the Ogden ALC were receiving appropriate support. The response rate differences were consistently high, never falling below 11.12 percent, and the chi square statistics were significant for all the investment item comparisons.

Comparing the results from the Ogden ALC in 1980 and 1984 showed that for both years, all the investment comparisons supported the basic hypothesis. For expense items, however, Ogden's comparison between requisitions with priorities 9-15 failed to support the hypothesis of faster programmed response times in 1984 while the same comparison supported the hypothesis in the 1980 data. In 1980, the comparison for priorities 1-8 and the comparison between programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8 both failed to support the hypothesis while the same comparisons in 1984 supported it.

Oklahoma City ALC (FH). All eight comparisons performed on the various subsets of requisitions for the Oklahoma City ALC supported the hypothesis of faster programmed response times. In each of these comparisons, the cumulative response rate analysis showed the programmed distribution to have higher cumulative response rate percentages in the first nine response time categories. As indicated by the data in table 4-7, the differences between

the programmed and non-programmed cumulative response rate percentages in these comparisons ranged from a high of 32.47 percent in the investment item comparison for requisitions of all priorities to a low of 2.59 percent in the investment item comparison between programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8.

TABLE 4-7
Analysis Summary for Oklahoma City ALC (1984)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	13.60	32.47	857.183
I	1-8	1-8	11.92	31.66	638.931
I	9-15	9-15	14.92	29.05	157.592
I	9-15	1-8	2.59	15.98	79.7788
E	All	All	12.16	16.20	611.039
E	1-8	1-8	11.99	17.69	380.222
E	9-15	9-15	12.39	14.76	244.938
E	9-15	1-8	11.98	15.18	325.642

In terms of the chi square analysis, the total chi square statistic for each of the comparisons exceeded the critical value of 23.5893, thus indicating that there was a statistical difference between the programmed and non-programmed distributions in all cases. The chi square statistic for each of the comparisons is listed in table 4-7. The cell by cell analysis portion of the chi square test showed that at the faster end of the response time spectrum, the actual values in the programmed cells exceeded the

expected values while the actual values for the non-programmed cells fell short of the expected values. Conversely, at the slower end of the response time spectrum, it was the actual values for the non-programmed cells that exceeded the expected value while the actual values in the programmed distributions fell below the expected number of responses.

In all the comparisons, this cell by cell analysis indicated that the programmed distributions were skewed toward the fastest response time category while the non-programmed distributions were skewed toward the slowest response time category. The results from both types of analysis suggest that CLSSA was performing as expected in terms of these comparisons for the Oklahoma City ALC.

The 1980 data for the Oklahoma City ALC indicated that programmed requisitions for investment items had faster response times than non-programmed requisitions for that year, a trend that continued in the same comparisons for 1984. While the investment item comparisons showed a continuing trend of support as expected, the comparisons for expense items reflected an improvement in support. Where two of the expense item comparisons failed to support the hypothesis of faster programmed response times in 1980, the 1984 comparisons supported the hypothesis in all four. In fact, the cumulative response rate analysis showed that the programmed rate exceeded the non-programmed rate by at least 11.98 percent throughout all four of these comparisons.

TABLE 4-8
Analysis Summary for Oklahoma City ALC (1980)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	14.75	20.61	208.260
I	1-8	1-8	19.29	24.85	143.480
I	9-15	9-15	12.22	18.96	91.0669
I	9-15	1-8	3.11	13.51	71.0374
E	All	All	4.18	10.63	157.401
E	1-8	1-8	-1.51	2.82	*
E	9-15	9-15	5.05	17.58	182.584
E	9-15	1-8	-6.47	1.16	*

* - One or more cells had expected values less than five, therefore, the chi square analysis could not appropriately be performed for this comparison.

Warner-Robins ALC (FL). Five of the eight comparisons performed on the various subsets of requisitions for the Warner-Robins ALC failed to support the hypothesis of faster programmed response times in accordance with the decision rules of this research. In five of the comparisons, the cumulative response rate analysis showed the programmed distribution to have higher cumulative response rate percentages in the first nine response time categories. However, in three comparisons non-programmed requisitions had higher cumulative response rates in several of the response time categories.

In the expense item comparison for requisitions of all priorities, the non-programmed distribution had higher cumulative response rates in the first six response time

categories. For the expense item comparison for requisitions with priorities 9-15, the non-programmed requisition distribution had higher cumulative response rates in all nine response time categories. The non-programmed cumulative response rate for this comparison was as much as 6.45 percent higher than that for the programmed distribution. For the expense item comparison between programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8, the programmed distribution had the higher cumulative response rate in only one of the nine response time categories.

TABLE 4-9
Analysis Summary for Warner-Robins ALC (1984)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	20.21	24.80	422.672
I	1-8	1-8	20.41	24.63	354.941
I	9-15	9-15	11.65	16.95	31.2824
I	9-15	1-8	5.94	10.18	16.7481
E	All	All	-1.54	0.60	9.1992
E	1-8	1-8	2.74	4.85	16.5862
E	9-15	9-15	-6.45	-1.14	15.6821
E	9-15	1-8	-2.19	0.22	6.8748

In the remaining five comparisons, the differences between the programmed and non-programmed cumulative response rate percentages ranged from a high of 24.80 percent in the investment item comparison for requisitions of all priorities to a low of 2.74 percent in the expense item comparison for requisitions with priorities 1-8.

In the chi square analysis, five of the eight comparisons, including two that had passed the cumulative response rate analysis, did not exceed the critical value of 23.5893, thus failing to register a statistically significant difference between the programmed and non-programmed distributions at the .005 significance level required by the decision rules for this research. Only three of the eight comparisons had chi square statistics that exceeded the critical value of 23.5893, indicating that there was a statistical difference between the programmed and non-programmed distributions. The chi square statistic for each of the comparisons is listed in table 4-5. In the three comparisons that did have statistical differences, the cell by cell analysis indicated that the programmed distributions were skewed toward the fastest response time category while the non-programmed distributions were skewed toward the slowest response time category.

The results from both types of analysis suggest that CLSSA was not performing as expected in terms of these comparisons for the Warner-Robins ALC. Expense items in particular did not perform as expected. Cumulative response rate differences between the programmed and non-programmed distributions for expense items ranged from a low of -6.45 to a high of only 4.85. All four expense item comparisons failed to register a statistically significant difference between the programmed and non-programmed distributions.

Investment items fared somewhat better with cumulative response rate differences that ranged from 24.80 percent to 5.94 percent and only one comparison which did not show a statistically significant difference in the programmed and non-programmed distributions.

In the parallel comparisons for Warner-Robins ALC, the 1980 investment item comparisons all supported the hypothesis of faster programmed response times while the 1984 comparison between programmed requisitions with priorities 9-15 and non-programmed requisitions with priorities 1-8 did not register a significant difference between the two distributions in the chi square analysis.

TABLE 4-10
Analysis Summary for Warner-Robins ALC (1980)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	16.49	17.52	103.069
I	1-8	1-8	18.19	22.36	82.4457
I	9-15	9-15	11.31	15.24	31.0227
I	9-15	1-8	14.49	18.89	46.6655
E	All	All	3.15	18.84	343.578
E	1-8	1-8	-0.86	4.56	*
E	9-15	9-15	4.37	22.46	370.826
E	9-15	1-8	-1.98	2.29	*

* - One or more cells had expected values less than five, therefore, the chi square analysis could not appropriately be performed for this comparison.

The 1980 comparisons for expense items were also more supportive of the basic hypothesis than the 1984

comparisons. In 1980, only two of the four comparisons failed to show programmed requisitions as having the faster response times. In the other two, the programmed cumulative response rate exceeded the non-programmed rate by as much as 22.46 percent. By 1984, none of the four comparisons showed faster programmed response times, and the largest difference in the cumulative response rates had dropped to 4.85 percent.

San Antonio ALC (FP). All eight comparisons performed on the various subsets of requisitions for the San Antonio ALC supported the hypothesis of faster programmed response times. In each of these comparisons, the cumulative response rate analysis showed the programmed distribution to have higher cumulative response rate percentages in the first nine response time categories. As indicated by the data in table 4-6, the differences between the programmed and non-programmed cumulative response rate percentages in these comparisons ranged from a high of 28.10 percent in the investment item comparison between requisitions with priorities 1-8 to a low of 1.43 percent in the expense item comparison for requisitions with priorities 9-15.

In terms of the chi square analysis, the total chi square statistic for each of the comparisons exceeded the critical value of 23.5893, thus indicating that there was a statistical difference between the programmed and non-programmed distributions in all cases. The chi square

statistic for each of the comparisons is listed in table 4-6. The cell by cell analysis portion of the chi square test showed that at the faster end of the response time spectrum, the actual values in the programmed cells exceeded the expected values while the actual values for the non-programmed cells fell short of the expected values. Conversely, at the slower end of the response time spectrum, it was the actual values for the non-programmed cells that exceeded the expected value while the actual values in the programmed distributions fell below the expected number of responses. In all the comparisons, this cell by cell analysis indicated that the programmed distributions were skewed toward the fastest response time category while the non-programmed distributions were skewed toward the slowest response time category. The results from both types of analysis suggest that CLSSA was performing as expected in terms of these comparisons for the San Antonio ALC.

TABLE 4-11
Analysis Summary for San Antonio ALC (1984)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	20.35	27.55	633.862
I	1-8	1-8	18.12	28.10	503.309
I	9-15	9-15	16.50	24.67	120.255
I	9-15	1-8	6.48	9.77	38.1185
E	All	All	2.91	14.33	431.768
E	1-8	1-8	4.14	17.70	472.703
E	9-15	9-15	1.43	11.60	109.100
E	9-15	1-8	1.78	10.35	172.965

This performance is an improvement over the results from 1980, summarized in table 4-12, when requisitions filled by the San Antonio ALC did not perform as expected for expense items. Three of the four comparisons for expense items did not perform as expected in either the cumulative response rate analysis or the chi square analysis. In terms of investment items, however, the 1984 performance represents the continuation of a trend of performance as expected that was seen in 1980 as well.

TABLE 4-12
Analysis Summary for San Antonio ALC (1980)

Type Item	Prog Priority	Non-Prog Priority	Response Rate Differences (%) Minimum	Maximum	Chi Square Statistic
I	All	All	17.76	22.53	255.461
I	1-8	1-8	19.66	22.86	152.040
I	9-15	9-15	15.45	23.30	125.856
I	9-15	1-8	11.69	15.09	50.9052
E	All	All	-0.03	1.95	17.0584
E	1-8	1-8	0.78	5.65	32.4805
E	9-15	9-15	-3.66	-1.06	21.3252
E	9-15	1-8	-1.12	1.68	20.3443

For investment items, both the 1980 and 1984 comparisons indicated that CLSSA was performing as expected at the San Antonio ALC. The expense comparisons, however, show a dramatic difference between the two years. In 1980, the expense item comparisons for the San Antonio ALC supported the basic hypothesis in only one of the four comparisons. The cumulative response rate analysis showed

non-programmed rates exceeding the programmed rates by as much as 3.66 percent while the programmed rate exceeded the non-programmed rate by at most 5.65 percent. By 1984, all four comparisons for expense items supported the hypothesis of faster programmed response times and the differences between the programmed and non-programmed cumulative response rates ranged from 1.43 percent to as high as 17.70 percent.

Summary

This chapter presented the results of this research effort in terms of the three factors addressed in this study: type of item being supported, requisition priority, and source of supply. It did this by summarizing the results of all the programmed versus non-programmed comparisons needed to answer the research questions associated with the basic question of this study: do programmed requisitions have faster requisition response times than non-programmed requisitions? These summaries highlight both the strengths and weaknesses of the CLSSA program. They show where CLSSA is meeting the expectations fostered by CLSSA theory and the directives governing the program as well as showing where the program does not meet these expectations. Chapter V draws on the analysis in this chapter in making some conclusions concerning the three factors addressed in this evaluation of CLSSA and concerning the overall performance of the program.

V. Conclusions

Chapter Overview

This chapter contains responses to the three basic investigative questions and reviews the four country case studies in light of the comparisons reviewed in the previous chapter. Based on these conclusions, this chapter then presents an overall evaluation and conclusion on CLSSA's performance related to the programmed versus non-programmed comparison of response times. Finally, based on the results of this and earlier research, this chapter recommends areas for further research into CLSSA's effectiveness.

Answers to Investigative Questions

The basic hypothesis this research examined was that programmed requisitions have faster response times than non-programmed requisitions. Through the use of certain investigative questions, this research was aimed at determining if this hypotnesis held true in terms of three key variables: (1) type of item being requisitioned, (2) requisition priority, and (3) ALC filling the requisition. The answers this research arrived at for each of these investigative questions are presented below.

Type of Item Being Requisitioned. In the overall comparisons for investment and expense items, CLSSA was performing as expected. The investment items comparison in particular showed a large difference in the support for

programmed versus non-programmed requisitions. In the overall investment item comparison, the cumulative response rate never dropped below 21.01 percent. The investment comparisons performed in terms of the other variables strongly supported these overall results, since only one failed to confirm the basic hypothesis of faster programmed response times. The results from the 1980 data suggest that this relative performance advantage for the programmed requisitions is the continuation of a pattern of better programmed support. All 24 of the investment item comparisons for 1980 confirmed the basic hypothesis.

The overall comparison for expense items showed that programmed requisitions received better support than non-programmed requisitions. Most of the subsequent expense item comparisons in terms of the other variables also supported the hypothesis of faster programmed response times, however, there were five cases in which expense item comparisons did not meet the criteria to confirm the basis hypothesis. Four of these five comparisons were for the Warner-Robins ALC, so it is likely that it was the ALC variable in combination with the type of item being requisitioned that caused the deviation from the expected results. These results do, however, represent an improvement over the results from the 1980 data. In that data, 11 of the 24 comparisons for expense items failed to support the hypothesis of faster programmed response times.

Requisition Priority. In the overall comparisons based on requisition priority, the results of each of the requisition priority comparisons supported the basic hypothesis for both investment and expense items. In the more detailed comparisons in terms of the other variables, there was no pattern of one requisition priority grouping not performing as expected. Of the five requisition priority comparisons that failed to support the basic hypothesis, there was a failure for each of the three requisition types. The comparisons for priorities 1-8 only registered one failure while the other two types of comparisons registered two each. These results do not, however, support a consistent or significant impact by the requisition priority variable on whether or not CLSSA performs as expected.

For the 1980 data, the requisition priority appeared to have an influence on whether or not programmed requisitions had faster response times for expense items. All five ALCs as well as the combined data grouping failed to support the basic hypothesis in their respective comparisons between programmed requisition with priorities 9-15 and non-programmed requisitions with priorities 1-8. Three of the comparisons for priorities 1-8 and one of the comparisons for priorities 9-15 also failed to support faster programmed response times for the 1980 data.

ALC Filling the Requisition. For the Sacramento, Oklahoma City and San Antonio ALCs, all eight comparisons based on type of item being requisitioned and requisition priority performed as expected. At the Ogden ALC, only one of the eight comparisons, expense items with priorities 9-15, failed to support the basic hypothesis. For the Warner-Robins ALC, however, five of the eight comparisons did not show faster programmed response times. In fact, for the expense item comparison for priorities 9-15, the programmed cumulative response rate did not exceed the non-programmed rate in any of the response time categories. These results suggest that the ALC filling the requisition is a variable with a significant impact on whether or not CLSSA performs as expected.

In the 1980 data, all of the ALCs had at least one comparison in which CLSSA failed to perform as expected. The Sacramento and Ogden ALCs each had only one such case while the Oklahoma and Warner-Robins ALCs each had two such cases. The San Antonio ALC had three comparisons for which CLSSA was not performing as expected. However, as mentioned earlier, these failures are more likely attributable to the influence of the type of item being supported than to the ALC filling the requisition. Accordingly, these results from 1980 do not necessarily suggest that the Warner-Robins ALC has consistently failed to give CLSSA requisitions appropriate treatment or that the San Antonio ALC has made

great strides to bring their treatment of CLSSA requisitions into line with the expectations of the program.

One caveat on this research's evaluation of the impact of the ALC variable is that the varying nature of the items supported by each ALC and other such differences between the individual ALCs were not examined. These peculiarities may account for some of the differences in the way CLSSA performed at the various ALCs. Another caveat on this portion of the research is that the total number of observations was split into increasingly smaller segments as the analysis reached this level. This was reflected in the fact that for some of the comparisons, the chi square test could not appropriately be performed.

A Country's CLSSA Participation Rate. The four countries examined in the validation of the results turned out as expected in all cases. Programmed requisitions had faster response times than non-programmed requisitions in each of the four cases, illustrating that CLSSA is performing as expected internally. These results show that the country's participation rate does not change the fact that programmed requisitions have faster response times.

The comparisons of the countries' entire response time distribution with the entire worldwide distribution also showed that CLSSA was performing as expected. The countries with the highest participation rates fared significantly better than the worldwide totals while the countries with

the lowest participation rates had slower response times. As might be expected, a country with a higher participation rate receives faster overall response rates by taking advantage of the faster programmed response times.

Evaluation of the CLSSA Program

On the whole, CLSSA appears to be performing as expected. The vast majority of the comparisons examined by this research met the theorized expectations. Even in the comparisons for the 1980 data, investment item support was in keeping with this research's expectations. Of the 56 investment item comparisons examined for both years, this research found only one that did not support the basic hypothesis of faster programmed response times.

For expense items, however, the results were slightly less supportive of the claims on CLSSA's behalf. The 1980 comparisons for expense items indicated that programmed response times were not necessarily faster in all the cases. The 1980 results even suggested that in some cases non-programmed requisitions received better support than programmed ones. By 1984, though, the expense item comparisons were generally supportive of the basic hypothesis of faster programmed response times, except when evaluated in conjunction with the Warner-Robins ALC.

Accordingly, this research cannot concur with the earlier negative evaluations of CLSSA's performance. Even the 1980 investment item comparisons, which roughly parallel

those performed by the earlier studies in time frame and type of items, do not support the results that they reported. Although the expense item comparisons for 1980 yielded negative results on CLSSA's performance, those studies did not examine expense items and thus could not have based their conclusions on those shortcomings. Even for expense items, the 1984 comparisons give CLSSA a positive report qualified only by the Warner-Robins ALC results.

Recommendations for Further Research

Earlier research was consistent in suggesting that CLSSA was not working as expected, both in terms of response time and cost. In light of this generally positive evaluation of CLSSA's response time effectiveness, further research may be in order. Future research could possibly validate, if not resolve, the obviously conflicting results between this and the earlier research studies. This future research could examine CLSSA's effectiveness from the response time perspective. Future evaluations using the other measures of CLSSA's effectiveness would give a broader validation of these conflicting results.

One of the claims of CLSSA is that it provides participating foreign countries' requisitions the same degree of support as requisitions by United States Air Force units with the same priority. (6:8-10) Although this research examined, and supported, the hypothesis that

programmed response times are faster than non-programmed ones, further research could compare the response times for United States Air Force units with those of CLSSA participants. This research suggests that it is to a country's benefit to participate in CLSSA, but it cannot conclude that CLSSA is meeting its advertised benefits relative to United States Air Force requisitions.

The Security Assistance Management Information System (SAMIS), used to collect the data for this research, is a relatively new system. Its early development, its present impact on the support provided foreign countries, and plans for its future development, are all possible topics for further research from a system analysis approach.

Appendix A: Glossary of Terms

BLANKET ORDER FMS CASE -- An agreement between a foreign customer and the U.S. Government for a specific category of items or services (including training) with no definitive listing of items or quantities. The case specifies a dollar ceiling against which orders may be placed throughout the ordering period, normally 12 months. (6:B-2)

CASE -- A contractual sales agreement between the U.S. and an eligible foreign country or international organization documented by DD Form 1513. One FMS case identifier is assigned for the purpose of identification, accounting, and data processing for each offer (DD form 1513). (SAMM B-2)

CONTROL LEVEL -- A computed stock level the IM and DO32 use when filling requisitions. Nonprogrammed requisitions are eligible to be filled from depot stocks if the asset position is above the control level. (13:section J)

CONTROL VALUE -- The financial limit of service code B and C programmed support that a CLSSA country may receive in a 12 month period. Except for the 1 year period following the implementation of an initial or major add program, the control value is the service code B and C LOA value. (12:vii)

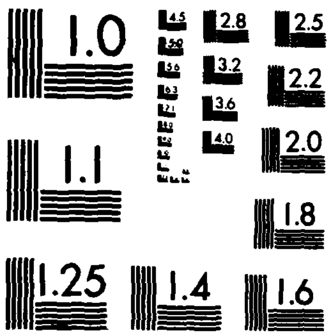
COOPERATIVE LOGISTICS -- The logistic support provided a foreign government/agency through its participation in the United States Department of Defense Logistics system with reimbursement to the U.S. for support provided. (SAMM B-4,5)

COOPERATIVE LOGISTICS SUPPLY SUPPORT ARRANGEMENT (CLSSA) -- The arrangement under which logistics support is provided to a foreign government through its participation in the U.S. DoD logistics system. (13:section J)

CREDIT --Transactions approved on a case-by-case ba is by the Departments of State, Treasury and Defense, which allow repayment of military export sales for periods beyond 120 days after delivery of materiel or performance of service. (6:B-5)

CREDIT GUARANTY -- A guaranty to any individual, corporation, partnership or other judicial entity doing business in the United States (excluding U.S. Government agencies other than the Federal Financing Bank) against political and credit risks of nonpayment arising out of their financing of credit sales of defense articles and defense services to eligible countries and international organizations. (6:B-5)

AD-A174 208 THE REQUISITION RESPONSE TIME EFFECTIVENESS OF 2/2
COOPERATIVE LOGISTICS SUPP (U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST B D SILVER
UNCLASSIFIED SEP 86 AFIT/GLM/LSM/86S-75 F/G 15/5 NL



CROCOPY RESOLUTION TEST CHART
TIONAL BUREAU OF STANDARDS-1963-A

DEFINED ORDER CASE -- These cases are characterized by separately identified line items on the DD Form 1513. (6:B-6)

DEPENDABLE UNDERTAKING -- A firm commitment by the foreign government or international organization to pay the full amount of a contract for new production or for the performance of defense services which will assure the U.S. against any loss on such contract and to make funds available in such amounts and at such times as may be required by the contract, or for any damages and costs that may accrue from the cancellation of such contract, provided that in the judgment of DoD there is sufficient likelihood that the foreign government or international organization will have the economic resources to fulfill the commitment. (6:B-6,7)

DRAWDOWN REQUISITION -- A requisition that is generated by the removal of a service code A item from the FMSO I. The purpose of the drawdown requisition is to remove the country's liability for a FMSO I item. (12:vii)

ELIGIBLE-TO-BE-PROGRAMMED QUANTITIY (EPQ) -- That portion of a FMSO I investment item SLQ that is available for coding a FMSO II requisition as a programmed demand. If the FMSO II requisition quantity is greater than the EPQ, the requisition quantity is greater than the EPQ, the requisition is coded as nonprogrammed. (13:section J)

EXPENSE ITEM -- An item that is expensed for accounting records at time of issue. These items are not considered to be reparable. Also referred to as EOQ items, consumable items, FINC items, service code B and C. (12:viii)

FINANCIAL CONTROL (FINC) -- This type of management applies to service code B and C (expense) items. These items are managed by dollar value. (12:viii)

FOLLOW-ON SUPPORT -- Recurring support required to maintain the operational status of the system/major item. (13:section J)

FOREIGN MILITARY SALES (FMS) -- That portion of United States security assistance authorized by the Arms Export Control Act (AECA), as amended. This assistance differs from the Military Assistance Program and the International Military Education and Training (IMET) Program in that the recipient provides reimbursement for defense articles and services transferred. Included cash sales from stocks (inventories, services, training) by the DoD. (6:B-9)

FOREIGN MILITARY SALES ORDER NO. 1 (FMSO I) -- Provides for pipeline capitalization of a cooperative logistics support arrangement, which consists of stock "on hand" and replenishment of stocks "on order" in which the participating country buys equity in U.S. supply system for support of a specific weapons system. Even though stocks are not moved to a foreign country, delivery (equity) does in effect take place when the country pays for the case. (6:B-9)

FOREIGN MILITARY SALES ORDER NO. 2 (FMSO II) -- Provides for replenishment of withdrawals for consumption-type items (repair parts, primarily) from the DoD supply system to include charges for accessorial costs and a systems service charge. (6:B-9)

INVESTMENT ITEM -- An item that can be repaired and reissued. Also referred to as reparable item, recoverable item, LINC item, or service code A. (13:section J)

LEAD TIME -- Generally refers to the amount of time required between issuance of a purchase request to a supplier and delivery of the item to depot. (12:viii)

LINE ITEM CONTROL (LINC) -- This type of management applies only to service code A (investment items). These items are managed by National Stock Number (NSN) and quantity. (13:section J)

LETTER OF OFFER AND ACCEPTANCE (LOA) -- U.S. Department of Defense (DD) Form 1513 Offer and Acceptance by which the U.S. Government offers to sell to a foreign government or international organization defense articles and defense services pursuant to the Arms Export Control Act (AECA), as amended. The DD Form 1513 lists the items and/or services, estimated costs, the terms and conditions of sale, and provides for the foreign government's signature to indicate acceptance. (6:B-11)

NONPROGRAMMED DEMAND -- A status assigned to a FMSO II requisition to indicate that on-hand depot assets will not normally be used to fill the requisition. Unless the asset position is above the control level, the requisitioned quantity will be backordered leadtime away. (12:ix)

NONRECURRING DEMAND -- A one time requirement Nonrecurring demand is indicated on the FMSO II requisition. (13:section J)

PROGRAMMED DEMAND -- A status assigned to a FMSO II requisition to indicate that on-hand depot assets should be considered when filling the requisition. Programmed requisitions priority 9-15 will be filled to the support

level. Programmed requisitions priority 1-8 will be filled to the zero balance level. (12:x)

RECURRING DEMAND -- An asset ordered to replenish and maintain previously established stock levels; an ongoing requirement. Recurring demand is indicated on the FMSO II requisition. (13:section J)

RENEGOTIATION -- the financial update of the FMSO I. Renegotiation is normally done every 6 months using a DD Form 1513-2. (12:x)

SECURITY ASSISTANCE MANAGEMENT INFORMATION SYSTEM (SAMIS) -- the computer system used for FMS management and requisition routing and control. (13:section J)

SERVICE CODE -- A code used in the CLSSA program to indicate the type of asset and the agency responsible for its management. Service code A items are USAF managed investment items. Service code B items are USAF managed expense items. Service code C items are DLA managed expense items. (13:section J)

STOCK LEVEL QUANTITY (SLQ) -- A quantity that the CLSSA country has established on the FMSO I as its service code A requirement. The amount of actual programmed support is limited to this quantity during any 17 month period. (13:section J)

SUPPORT LEVEL -- A computed stock level the IM and DO32 use when filling requisitions. Programmed requisitions priority 9-15 are eligible to be filled from depot stock down to the support level. (13:section J)

ZERO BALANCE -- A stock level the IM and DO32 use when filling requisitions. Programmed requisitions priority 1-8 are eligible to be filled from depot stocks down to the zero level. (13:section J)

```
SAMIS        18 OCTOBER 1985 (85291)        TIME: 15:55:03        MDD: CKQ
                                                                  OFFICE: XMDC
**********     FILL TIME STATISTICS INTERROGATION                 290      **********

     ENTER OPTIONAL DATA SELECTION ELEMENTS BELOW:
          (EITHER COUNTRY ACTIVITY CODE OR NIIN MUST BE FILLED)

          COUNTRY ACTIVITY CODE.. __          FSC..... ____
          CASE DESIGNATOR..... ___            NIIN..... _________
          LINE ITEM NUMBER..... ___           MMC..... __

          ROUTING IDENTIFIER.....  ___  (1,2 OR 3 POSITIONS)
          REPAIR/REPLACE REQUISITIONS...  _  (H CODE REQUISITIONS)

     ENTER REQUIRED ELEMENTS BELOW:

                                              FILL TIME RANGES
          OUTPUT FILL TIME RANGES..... _      A - 15 DAY INTERVALS
                                              B - 30 DAY INTERVALS
                                              C - 60 DAY INTERVALS
          HISTORY START DATE..... _____       D - 90 DAY INTERVALS
          HISTORY END DATE..... _____

** ALTERNATE OPTION: ______ QUICK ACCESS ID OR H-HELP,Q-QUIT,R-RETURN TO TOP **
```

FILL TIME STATISTICS

PCN: U-W001.-HBV — PART 1 - COMPLETE SHIPMENTS — MDD: CKQ — OFFICE: XMDC

INPUT SELECTION DATA — DATE: 86038 — PAGE: 34

COUNTRY: — FSC: — START DATE: 84001 — ROUTING ID: ALL

CASE/LINE: — NIIN: — END DATE: 84365

ROUTING ID: F — NMC: — REPAIR/REPLACE REQUISITIONS:

	001-030	031-060	061-090	091-120	121-150	151-180	181-240	241-300	301-360	OVER 360	TOTAL
INVESTMENT ITEMS											
PROG PRIORITY 1-8	4375	689	426	337	291	199	349	198	127	226	7217
PROG PRIORITY 9-15	804	158	111	97	74	61	99	79	61	109	1653
TOTAL PROGRAMMED	5179	847	537	434	365	260	448	277	188	335	8870
NON-PROG PRIORITY 1-8	3325	848	597	942	466	408	664	433	322	877	8880
NON-PROG PRIORITY 9-15	1308	333	256	341	228	175	374	204	182	483	3884
TOTAL NON-PROGRAMMED	4633	1179	853	1283	694	583	1038	637	504	1360	12764
NON-CLSSA PRIORITY 1-8	85	17	8	22	9	12	23	11	9	25	221
NON-CLSSA PRIORITY 9-15	70	30	20	26	10	13	16	15	15	73	288
TOTAL NON-CLSSA	155	47	28	48	19	25	39	26	24	98	509
TOTAL INVESTMENT ITEMS	9967	2073	1418	1765	1078	868	1525	940	716	1793	22143
EXPENSE ITEMS											
PROG PRIORITY 1-8	45716	1930	1239	1000	887	658	1095	782	645	1182	55034
PROG PRIORITY 9-15	43434	3250	1488	1198	1070	881	1450	1166	899	1677	56494
TOTAL PROGRAMMED	89150	5180	2727	2199	1957	1519	2545	1948	1444	2859	111528
NON-PROG PRIORITY 1-8	4110	278	199	150	161	137	281	188	173	286	5957
NON-PROG PRIORITY 9-15	2424	270	113	77	64	63	101	76	68	154	3414
TOTAL NON-PROGRAMMED	6534	548	312	227	225	200	382	264	241	440	9371
NON-CLSSA PRIORITY 1-8	425	47	52	37	29	31	61	81	66	134	963
NON-CLSSA PRIORITY 9-15	885	83	57	27	44	33	70	60	72	170	1503
TOTAL NON-CLSSA	1310	132	109	64	73	64	131	141	138	304	2466
TOTAL EXPENSE ITEMS	96994	5858	3148	2480	2255	1783	3058	2353	1823	3603	123385
TOTAL PAGE	106961	7931	4566	4245	3333	2651	4583	3293	2539	5396	145498

FILL TIME STATISTICS

PCN: U-W001,-HBV — PART II - PARTIAL SHIPMENTS — MDD: CKQ — OFFICE: XMDC

INPUT SELECTION DATA — DATE: 86038 — PAGE: 35

COUNTRY: — FSC: — START DATE: 84001 — ROUTING ID: ALL

CASE/LINE: — NIIN: — END DATE: 84365

ROUTING ID: F — NMC: — REPAIR/REPLACE REQUISITIONS:

	001-030	031-060	061-090	091-120	121-150	151-180	181-240	241-300	301-360	OVER 360	TOTAL
INVESTMENT ITEMS											
PROG PRIORITY 1-8	16	6	4	2	3	0	1	3	0	10	45
PROG PRIORITY 9-15	5	0	2	1	1	0	1	1	3	2	16
TOTAL PROGRAMMED	21	6	6	3	4	0	2	4	3	12	61
NON-PROG PRIORITY 1-8	20	11	6	23	16	11	19	18	18	63	206
NON-PROG PRIORITY 9-15	5	7	6	8	8	4	14	13	12	58	135
TOTAL NON-PROGRAMMED	25	18	12	31	24	15	33	32	30	121	341
NON-CLSSA PRIORITY 1-8	1	1	0	1	0	1	0	1	0	4	9
NON-CLSSA PRIORITY 9-15	0	0	0	1	0	0	2	1	2	5	11
TOTAL NON-CLSSA	1	1	0	2	0	1	2	2	2	9	20
TOTAL INVESTMENT ITEMS	47	25	18	36	28	16	37	38	35	142	422
EXPENSE ITEMS											
PROG PRIORITY 1-8	420	28	18	21	14	16	23	21	16	64	640
PROG PRIORITY 9-15	440	54	27	25	17	14	30	37	28	94	766
TOTAL PROGRAMMED	860	82	45	46	31	30	52	58	44	158	1406
NON-PROG PRIORITY 1-8	32	6	5	2	6	3	3	7	6	19	89
NON-PROG PRIORITY 9-15	21	6	5	3	3	2	4	5	4	12	65
TOTAL NON-PROGRAMMED	53	12	10	5	9	5	7	12	10	31	154
NON-CLSSA PRIORITY 1-8	11	2	1	2	2	1	2	1	4	5	31
NON-CLSSA PRIORITY 9-15	0	3	0	0	4	1	2	0	3	14	27
TOTAL NON-CLSSA	11	5	1	2	6	2	4	1	7	19	58
TOTAL EXPENSE ITEMS	924	99	56	53	46	37	63	71	61	208	1618
TOTAL PAGE	971	124	74	89	74	53	100	109	96	350	2040

FILL TIME STATISTICS

PCN: U-W001,-HBV — PART III - OPEN REQUISITIONS — MUD: CKQ — OFFICE: XNDC

INPUT SELECTION DATA — DATE: 86038 — PAGE: 36

COUNTRY: — FSC: — START DATE: 84001 — ROUTING ID: ALL

CASE/LINE: — NIIN: — END DATE: 84365

ROUTING ID: F — MMC: — REPAIR/REPLACE REQUISITIONS:

	001-030	031-060	061-090	091-120	121-150	151-180	181-240	241-300	301-360	OVER 360	TOTAL
INVESTMENT ITEMS											
PROG PRIORITY 1-8	0	0	0	0	0	0	0	0	0	328	328
PROG PRIORITY 9-15	0	0	0	0	0	0	0	0	0	190	190
TOTAL PROGRAMMED	0	0	0	0	0	0	0	0	0	518	518
NON-PROG PRIORITY 1-8	0	0	0	0	0	0	0	0	0	2047	2047
NON-PROG PRIORITY 9-15	0	0	0	0	0	0	0	0	0	1494	1494
TOTAL NON-PROGRAMMED	0	0	0	0	0	0	0	0	0	3541	3541
NON-CLSSA PRIORITY 1-8	0	0	0	0	0	0	0	0	0	103	103
NON-CLSSA PRIORITY 9-15	0	0	0	0	0	0	0	0	0	143	143
TOTAL NON-CLSSA	0	0	0	0	0	0	0	0	0	246	246
TOTAL INVESTMENT ITEMS	0	0	0	0	0	0	0	0	0	4305	4305
EXPENSE ITEMS											
PROG PRIORITY 1-8	0	0	0	0	0	0	0	0	0	1726	1726
PROG PRIORITY 9-15	0	0	0	0	0	0	0	0	0	2324	2324
TOTAL PROGRAMMED	0	0	0	0	0	0	0	0	0	4050	4050
NON-PROG PRIORITY 1-8	0	0	0	0	0	0	0	0	0	457	457
NON-PROG PRIORITY 9-15	0	0	0	0	0	0	0	0	0	227	227
TOTAL NON-PROGRAMMED	0	0	0	0	0	0	0	0	0	684	684
NON-CLSSA PRIORITY 1-8	0	0	0	0	0	0	0	0	0	279	279
NON-CLSSA PRIORITY 9-15	0	0	0	0	0	0	0	0	0	209	209
TOTAL NON-CLSSA	0	0	0	0	0	0	0	0	0	488	488
TOTAL EXPENSE ITEMS	0	0	0	0	0	0	0	0	0	5222	5222
TOTAL PAGE	0	0	0	0	0	0	0	0	0	9527	9527

Appendix D: Computer Analysis Programs

```
c     ******************************************************
c     This program performs a chi square test on a 2 X 10
c     matrix.  It compares two distributions in files that
c     are designated interactively with the program.  The
c     chi square output includes the actual, expected, and
c     chi square statistic contribution for each cell in the
c     matrix and the total chi square statistic.  This
c     program also computes the cummulative response rate
c     percentage for programmed and non-programmed in each
c     response time category as well as the difference
c     between the cummulative percentages in each category.
c     ******************************************************
c
c     ******************************************************
c     DIRECTIONS:  The program will prompt you for some
c     identification of the category of the comparison.
c     This enables you to put up to 25 characters of label
c     on the output to identify it by.  After inputing the
c     label, hit RETURN.  The program will then prompt you
c     for the programmed file, then the non-programmed file
c     that you want to use in the comparisons.  Enter the
c     desired data files, hitting RETURN after each one.
c     The program will then prompt you for the name of the
c     file you want the results in.  Once again, enter a
c     file name and hit RETURN.  The program will run the
c     comparisons and put the formatted output into the
c     designated file.
c     ******************************************************
c
c     ------------------------------------------------------
c     |                                                    |
c     |   Variable Key:                                    |
c     |                                                    |
c     |   newfil:  file to be created for the results      |
c     |   progf:  file with programmed distribution data   |
c     |   nprogf:  file with non-programmed distribution data |
c     |   cat:  category the comparison falls under        |
c     |   data:  matrix with all the distribution data     |
c     |   progn:  number of programmed requisitions        |
c     |   nprogn:  number of non-programmed requisitions   |
c     |   expect:  expected cell values                    |
c     |   chi:  chi square cell values                     |
c     |   chitot:  cummulative chi square value for all cells |
c     |   days:  matrix with the response time category labels |
c     ------------------------------------------------------
c
c
c     Declare variables
c
      integer progn, nprogn, data(2,10), day(2,10)
      real expect(2,10), chi(2,10), chitot, pcnt(3,10)
      character newfil*15, progf*15, nprogf*15, cat*25
c
c     Interactively input an identifying label for on the output,
c     the data files the comparisons are to be performed for, and
c     the output file for the formatted results.
c
      print *, "What is the category of this comparison?"
      read *, cat
      print *, "What is the programmed file?"
      read *, progf
      print *, "What is the non-programmed file?"
      read *, nprogf
      print *, "What file do you want the results in?"
      read *, newfil
      open (unit = 2, file = progf, status = 'old')
```

```
      open (unit = 3, file = nprogf, status = 'old')
      open (unit = 4, file = newfil, status = 'new')
      open (unit = 8, file = 'days', status = 'old')
c
c   Initialize variables
c
      progn = 0
      nprogn = 0
      ntotal = 0
      chitot = 0
c
c   Read the data from the given distributions and calculate
c   the total number of observations in each data set
c
      do 10 i=1,10
         read (2,*) data(1,i)
         read (3,*) data(2,i)
         progn = progn + data(1,i)
         nprogn = nprogn + data(2,i)
   10 continue
c
c   Call the subroutine percent to perform the cummulative
c   response rate analysis on the data
c
      call percent (progn, nprogn, data, pcnt)
c
c   Call the subroutine chitest to perform the chi square
c   analysis on the data
c
      call chitest (data, progn, nprogn, expect, chi, chitot)
c
c   Standard Output Formats
c
   30 format (t3,i3,'-',i3,t15,f6.2,t31,f6.2,t45,f6.2)
   40 format (t3,i3,'-',i3,t14,i8,t25,f8.2,t37,f8.4,t54,i8,t65,f8.2,t77
     & ,f8.4)

c   Format the output
c
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) '*****************************************************'
      write (4,*) '*   REQUISITION RESPONSE TIME COMPARISON            *'
      write (4,*) '*   CUMMULATIVE RESPONSE RATE ANALYSIS              *'
      write (4,*) '*   AND CHI SQUARE ANALYSIS                         *'
      write (4,*) '*****************************************************'
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) 'THIS COMPARISON IS BASED ON:  ', cat
      write (4,*) 'THE PROGRAMMED FILE IS:       ', progf
      write (4,*) 'THE NON-PROGRAMMED FILE IS:   ', nprogf
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) ' '
      write (4,*) 'CUMMULATIVE RESPONSE RATE ANALYSIS'
      write (4,*) ' '
      write (4,*) 'Response'
      write (4,*) 'Time        Cummulative Response Rate Percentage'
      write (4,*) 'Category    Programmed    Non-Programmed    Difference'
      write (4,*) ' '
      do 50 i=1,10
         read (8,*) day(1,i)
```

```
         read (8,*) day(2,i)
         write (4,3Ø) day(1,i),day(2,i),pcnt(1,i),pcnt(2,i),pcnt(3,i)
5Ø    continue
      write (4,*) " "
      write (4,*) " "
      write (4,*) " "
      write (4,*) "CHI SQUARE ANALYSIS"
      write (4,*) " "
      write (4,*) "Response"
      write (4,*) "Time          Programmed
     & Non-Programmed"
      write (4,*) "Category      Actual    Expected    Chi Square
     & Actual    Expected    Chi Square"
      write (4,*) " "
      do 6Ø i=1,1Ø
         write (4,4Ø) day(1,i),day(2,i),data(1,i),expect(1,i),chi(1,i)
     &    ,data(2,i)
     &    ,expect(2,i),chi(2,i)
6Ø    continue
      write (4,*) " "
      write (4,*) "TOTAL CHI SQUARE STATISTIC:  ",chitot
      end


c   ****************************************************************
c   This subroutine calculates the cummulative percentage of
c   requisitions that have been filled through each response
c   time category for both programmed and non-programmed
c   requisitions.  It also calculates the difference between
c   the cummulative percentage for programmed and non-programmed.
c   ****************************************************************
c
c   ****************************************************************
c   DIRECTIONS:  This subroutine is run by the main program.
c   There is no direct user interaction with this subroutine.
c   ****************************************************************
c
c
c   ---------------------------------------------------------------
c   |                                                             |
c   |   Variable Key:                                             |
c   |                                                             |
c   |   progn:  total number of programmed requisitions           |
c   |   nprogn:  total number of non-programmed requisitions      |
c   |   data:  matrix with all the distribution data              |
c   |   pacum:  programmed cummulative actual values              |
c   |   npacum:  non-programmed cummulative actual values         |
c   |   pcnt:  the matrix containing the programmed and non-      |
c   |          programmed cummulative percentages and the         |
c   |          difference between the two                         |
c   ---------------------------------------------------------------
c
c
      subroutine percent (progn, nprogn, data, pcnt)
c
c   Declare variables, initialize files
c
      integer data(2,1Ø), i, pacum, npacum, progn, nprogn
      real pcnt(3,1Ø)
      pacum = Ø
      npacum = Ø
      do 7Ø i =1,1Ø
         pacum = pacum + data(1,i)
         npacum = npacum + data(2,i)
         pcnt(1,i)=(real(pacum)/real(progn))*1ØØ
         pcnt(2,i)=(real(npacum)/real(nprogn))*1ØØ
         pcnt(3,i)=pcnt(1,i)-pcnt(2,i)
7Ø    continue
      end
```

```
c     ********************************************************
c     This subroutine takes a 2 x 10 matrix from the main
c     program along with counts of the total number of
c     programmed and non-programmed requisitions and
c     calculates the expected value and the contribution
c     to the chi square statistic for each of the cells in
c     the matrix.
c     ********************************************************
c
c     ********************************************************
c     DIRECTIONS:  This subroutine is run by the main
c     program.  There is no direct user interaction with
c     this subroutine.
c     ********************************************************
c
c     ------------------------------------------------------------
c     |                                                          |
c     |   Variable Key:                                          |
c     |                                                          |
c     |   data:  matrix with all the distribution data           |
c     |   progn:  number of programmed requisitions              |
c     |   nprogn:  number of non-programmed requisitions         |
c     |   ntotal:  total number of requisitions                  |
c     |   expect:  expected cell values                          |
c     |   chi:  chi square cell values                           |
c     |   chitot:  cummulative chi square value for all cells    |
c     |   probp:  probability of a programmed requisition        |
c     |   probn:  probability of a non-programmed requisition    |
c     ------------------------------------------------------------
c
c
      subroutine chitest (data, progn, nprogn, expect, chi, chitot)
c
c     Declare variables
c
      integer progn, nprogn, ntotal, data(2,10)
      real expect(2,10), chi(2,10), chitot, probp, probn
c
c     Calculate the total number of observations and the
c     probability for programmed and non-programmed
c
      ntotal = progn + nprogn
      probp = real(progn)/real(ntotal)
      probn = real(nprogn)/real(ntotal)
c
c     Calculate the expected value and chi square value for
c     each cell and total the chi square values
c
      do 20 i=1,10
         expect(1,i) = (data(1,i) + data(2,i)) * probp
         expect(2,i) = (data(1,i) + data(2,i)) * probn
         chi(1,i) = (data(1,i) - expect(1,i))**2 / expect(1,i)
         chi(2,i) = (data(2,i) - expect(2,i))**2 / expect(2,i)
         chitot = chitot + chi(1,i) + chi(2,i)
   20 continue
      end
```

```
c     ************************************************************
c     This program creates the data files for use by the chitest
c     program through interactive input with the user.  The three
c     categories of shipments from the SAMIS output are all
c     consolidated into one time period cell.
c     ************************************************************
c
c     ************************************************************
c     DIRECTIONS:  The program will prompt you for the name of
c     the data file that you are creating.  Enter a name of 15
c     characters or less and hit RETURN.  The program will then
c     prompt you for the number of responses in each of the
c     response time categories.  Data #1 corresponds to response
c     time category ØØ1-Ø3Ø on SAMIS' Fill Time Statistics
c     output.  Enter the value from the SAMIS output and hit
c     RETURN for each of the categories prompted for by the
c     program.  Under open shipments, the program will only
c     prompt for data #1Ø corresponding to the over 36Ø category.
c     When you have entered the last category of data, the
c     program will automatically enter the consolidated input
c     into the file you indicated initially.
c     ************************************************************
c
c     ____________________________________________________________
c     |                                                          |
c     |   Variable Key:                                          |
c     |                                                          |
c     |   newfil:  name of the data file to be created           |
c     |   comp:  number of completed shipment per time period    |
c     |   part:  number of partial shipments per time period     |
c     |   open:  number of open shipments per time period        |
c     |   data:  cummulative number of shipments per time period |
c     |__________________________________________________________|
c
c

      integer comp(1Ø), part(1Ø), open(1Ø), data(1Ø)
      character newfil*15
c
c     Interactive input of the name of the data file to be created
c
      print *, "What file do you want to create?"
      read *, newfil
      open (unit=4,file=newfil,status='new')
c
c     Interactive input of the complete shipments data
c
      do 1Ø i=1,1Ø
         print *, "complete shipments data #",i
         read (5,*) comp(i)
   1Ø continue
c
c     Interactive input of the partial shipments data
c
      do 2Ø i=1,1Ø
         print *, "partial shipments data #",i
         read (5,*) part(i)
   2Ø continue
c
c     Interactive input of the open shipments data
c     Note:  Since the data is "aged", there will only be
c     data for open shipments over 36Ø days old.
c
      do 3Ø i=1,9
         open(i)=Ø
   3Ø continue
```

```
      print *, "open shipments data # 10"
      read (5,*) open(10)
c
c   Sums the number of shipments for each response time
c   category and enters it into the data file.
c
      do 40 i=1,10
         data(i)=comp(i)+part(i)+open(i)
         write (4,*) data(i)
   40 continue
      end
```

```
c     ************************************************************
c     This program merges data files for use by the chitest
c     program through interactive input with the user.  It will
c     take two data files and add the data in corresponding
c     response time categories to get a consolidated data file.
c     This is especially helpful for merging the data from the
c     files containing data classified by requisition priority
c     into a single file for either programmed or non-programmed.
c     ************************************************************
c
c     ************************************************************
c     DIRECTIONS:  The program will prompt you for the name of
c     the new data file that you want to create by merging.
c     Enter a name of a new file of 15 or fewer characters and
c     hit RETURN.  The program will then prompt you for the two
c     files that will be merged into the new data file.  These
c     must also be 15 characters or shorter in length, and they
c     must already exist, or you will get an error.  After
c     entering each name, hit RETURN.  The program will merge the
c     files automatically and enter the data in the new data file
c     that you designated initially.
c     ************************************************************
c
c
c     ------------------------------------------------------------
c     |                                                          |
c     |   Variable Key:                                          |
c     |                                                          |
c     |   newfile:  the name of the new file to be created       |
c     |   filea:  the name of the first file to be merged        |
c     |   fileb:  the name of the second file to be merged       |
c     |   dataa:  the value from filea for a given time period   |
c     |   datab:  the value from fileb for a given time period   |
c     |   data:  cummulative number of shipments per time period |
c     |__________________________________________________________|
c
c

      integer dataa, datab, data
      character newfil*15, filea*15, fileb*15
c
c     Interactive input of the new data file to be created and the
c     data files to be merged to create the file.
c
      print *, "What file do you want to create?"
      read *, newfil
      print *, "What is the first file to be merged?"
      read *, filea
      print *, "What is the second file to be merged?"
      read *, fileb
      open (unit=2,file=filea,status='old')
      open (unit=3,file=fileb,status='old')
      open (unit=4,file=newfil,status='new')
c
c     Merging of the data files and input into the new data file
c
      do 10 i=1,10
         read (2,*) dataa
         read (3,*) datab
         data = dataa + datab
         write (4,*) data
   10 continue
      end
```

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This investigation compared the response time performance of programmed and non-programmed requistions by foreign countries under the Cooperative Logistics Supply Support Arrangement (CLSSA) program. These comparisons focused on three key variables, (1) the type of item being requisitioned (either an investment item or an expense item), (2) the requisition priority with which the request is submitted, and (3) the Air Logistics Center (ALC) supporting the requisition. For the purpose of this research, requisitions submitted in 1984 were the primary focus of the evaluation with those submitted in 1980 serving as a reference point for CLSSA's performance.

Requisitions in each of the comparisons were grouped by their response time in days. The resulting distributions were then analyzed using the chi square test and the cumulative frequency distribution. This analysis highlighted, in terms of the key variables, the areas where CLSSA was working as expected as well as the areas where it was not working as expected. The results of this evaluation suggest that overall ther are significant benefits to participating in CLSSA. There are, however, certain categories of requisitions that may not be receiving appropriate treatment.

END

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